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* ***Note to Binder.***—These are to be bound to follow the last number in the volume of the JOURNAL OF TROPICAL MEDICINE AND HYGIENE.

Original Communications.

BRONCHOMONILIASIS IN THE ANGLO-EGYPTIAN SUDAN AND EGYPT.

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Contents.—*Introductory—Historical—Two Sudan Cases—Egyptian and Sudan Cases—Fourth Sudan Case—Summary—Acnowledgements—References—Illustrations.*

Introductory.—Some years ago one of us, in conjunction with Captain O'Farrell, R.A.M.C., demonstrated the presence of *Castellani's Bronchial spirochætosis* in the Anglo-Egyptian Sudan, and these observations were extended considerably from a morphological point of view by Fantham working on our Sudan cases. Since then this form of bronchitis has become recognized as one of the diseases of the Sudan.

Further studies during the last few years have demonstrated the presence of *Castellani's Bronchomoniliasis* and other forms of bronchomycosis in the Sudan, and by the kindness of Dr. Farah, of Alexandria, we have been able to establish its presence in Egypt.

We think that some record of this disease as seen in the Sudan and Egypt may be of interest, and therefore we bring forward the following notes.

Historical.—Previous to Castellani's researches, which began as far back as 1905 in Ceylon, the subject of bronchitis received little or no study in the Tropics, and it is entirely due to his initiative that a number of causal agents have been recognized and that the various diseases called Bronchial Spirochætosis, Bronchial Moniliasis, Bronchial Oidiomycosis, &c., have been established as tropical diseases. The last named disease has been fully considered by Magalhaes in 1918. Restricting our attention in this communication to *Bronchomoniliasis*, as mentioned above, the history begins with Castellani's observations in 1905.

In 1910 he pointed out that during six years' residence in Ceylon he had met with twenty cases of subchronic and chronic bronchitis which, on superficial examination, might be thought to be tubercular in nature, but in which there was a constant *absence of the tubercle bacilli* and negative results with the ophthalmic and cuti-reactions. In these cases the spirochætes of *Bronchial spirochætosis* were also absent.

He divided the cases of *primary infection* into those with a *mild* and those with a *graver form* of the disease, while he also recognized a *secondary infection* occurring in association with other illnesses.

In the *Primary Mild Type* the patient complains of cough and expectorates a muco-purulent sputum. There is no fever and the general condition is good, but examination of the chest may reveal the presence of a few moist râles. In this type spontaneous cure may take place or the patient may pass into the severe form.

In the *Primary Graver Type* the symptoms are not unlike phthisis. There is hectic fever, muco-purulent and hæmorrhagic expectoration, patches of dullness, fine crepitations and pleuritic rubs. This form is often fatal.

The treatment of both types is based upon the fact that *potassium iodide*, in some form, kills these fungi. Castellani advises that it be given in 15 gr. doses in milk or water three times a day. This treatment requires about 3 to 4 weeks to effect a cure in mild cases, while *Saiodin* may also be employed, being administered in cachets.

In 1913 Castellani drew attention to the possibility of infection from man to man and from fungi growing saprophytically in nature. Among these latter he cites the monilia-like fungi which he found in tea-dust in Ceylon. He also reports the successful infection of a guinea-pig by regularly applied insufflations of monilia cultures through the nose.

In March, 1917, Pijper published a valuable communication upon the disease as seen in the Transvaal, and continued this work in 1918 by describing *M. bethaliensis*, which produces acid and gas in *glucose* and *maltose*.

Castellani's latest remarks will be found on pages 1886 to 1889 of the third edition of the "Manual of Tropical Medicine," written by himself and one of us, and published this year.

In October, 1919, Farah, writing upon Bronchospirochætosis as seen in Egypt, mentions the existence of broncho-moniliasis in that country.

So far as our literature in Khartoum goes this completes a summary of the published communications on this subject, and in the references at the end of this note we have put down all those with which we are acquainted. It will be observed that we cannot quote any post-mortem observations.

Turning now to the botanical aspect of the history, we have asked ourselves the exact origin and definition of the word *Monilia*.

We have expended a certain amount of time on this inquiry, and we may definitely state with regard to these fungi that, in our opinion, it is useless to go further back than Saccardo's *Sylloge Fungorum*, nevertheless we will give in small print the results of our inquiries in case anyone be interested therein.

The history of the genus *Monilia* begins in Micheli's *Nova Plantarum Genera* which appeared in 1729, when he published under the term Aspergillus two fungi, which he illustrated on plate 91 in figures 3 and 4. He describes the first as:—

"Aspergillus albus, tenuissimus, graminis dactyloidis facie, seminibus rotundis. In dimidiato et semiputrido Malo Limonio dumtaxat cum vidimus."

The second he describes as:—

"Aspergillus terrestris, cespitosus ac ramosus albus. Junio mense, in Regio viridario supramemorato."

In the 12th edition of *Linnæus' Systema Naturæ*, of which Vol. II appeared in 1767, these two fungi are named *Mucor cespitosus* on p. 727. In Gmelin's so-called 13th edition of

Linnæus' Systema, of which Vol. II appeared in Leipsic in 1791, these fungi together with *Mucor crustaceus*, *Mucor glaucus* and *Mucor leprosus*, are made into a genus *Monilia*, and are joined by other fungi described by Scopoli, by Haller, and in Bulliard's *Herbier-Histoire des Champignons*.

Now the first-mentioned form, and hence presumably the type, is *M. crustacea*, which was first described in 1757 in Holm's Flora Danica, and published in Vol. V, *Amœnitates Academicæ*, which appeared in 1760, but this is not procurable in Khartoum.

It will be noted that Micheli's genus *Aspergillus* was not recognized by Linnæus or by Gmelin.

We now come to Persoon's *Tentamen dispositionis methodicæ*, which was published in Leipsic in 1797, and in which, on page 40, *Monilia* is defined. This is the usually accepted starting point for the genus (*vide* Saccardo and other authors).

We do not possess this work, but we have *Persoon's Synopsis Methodica Fungorum*, published in 1801, where, on page 691, he defines the genus as "Stipitata, aut effusa byssoidea. Fila moniliformia seu articulata." He divides the genera into three groups, "Capitulum Rotundum," "Aspergillus," and "Torula."

It is possible that all the forms mentioned above may be ruled out of the genus as we know it except, perhaps, those mentioned under Persoon's "Torula Subgroup," which is defined as "Torula: effusa, acaulis, filis articulatis, indeterminate, effusis mucidis," of which three species are recognized, *Monilia fructigena*, *Monilia herbarum*, *and Monilia antennata*. The last named came under "Torula" when it was raised to the level of a genus. Monilia is left, therefore, with two forms, and as they are recognized as belonging to the genus *Monilia* by Saccardo, *M. herbarum* might perhaps be accepted as the type of Persoon's, but not of Gmelin's, *Monilia* as it appears on page 25 of his "Observationes Mycologicæ," published in Leipsic in 1796, as *Torulo monilia*, while *M. fructigena* is placed on page 26, but neither have been studied by modern methods, and therefore it may be advisable to take a well known species as the type.

Now it is obvious that if the laws of botanical nomenclature are pressed the name *Monilia* should disappear, as Gmelin's species are probably either Aspergillus or Penicillium, while strictly speaking "Torula" should apply to *Monilia fructigena* and *M. herbarum*, but this will cause much confusion. Also, perhaps, the genus as known to-day is neither Persoon's nor Gmelin's.

We now come to Link's "Observationes in Ordines plantarum naturales (Fungos tantum) Dissertation, I.," which appeared in 1809 in the *Magazin der Gesellschaft Naturforschender Freunde*, 3 Jahrgang, Seite 1. We have been unable to refer to this publication, but we have in front of us Link's 1824 writings, and we find that on page 16 of the "Observations" he created the genus *Oidium* for his *Oidium aureum*, and that his *Oidium fructigena* is marked with a note of interrogation as being possibly Persoon's *M. fructigena* and *Torula fructigena*, while he keeps *Monilia antennata* as his type of *Monilia*, and later he uses Persoon's *M. herbarum* as the type of the genus *Torula*.

The next complication is introduced by Fries in 1829 when he recognized *Hill's Monilia*, and quotes "Hill, *ess* p. 396," but this publication we have failed to trace. Be this as it may, there is a consensus of opinion that the three species so defined are not Persoon's Moulia. Bonorden accepts the Hill-Fries genus.

If more modern works are searched the confusion outlined above will be clearly noted. We have been unable to refer to "Streinz (1862) *Nomenclator Fungorum*. Vindobonæ," and therefore cannot say whether this publication will throw any light on the question at issue.

Gedelst in 1902 recognized Hill's genus, but in 1911 went back to Persoon's genus, of which in 1904 Guéguen gave a good definition which is as follows:

"Conidiophores dressés simples ou subsimples souvent densément rapprocbés, rarement epars, émettant à leur sommet une chainnette de conidies grosses, limoniformes. Souvent munies d'un appareil de disjonction."

From 1905 onwards there come the publications of Castellani already referred to above.

In 1915 Chalmers and Archibald reviewed the genus in their publication, "Fungi Imperfecti in Tropical Medicine."

From the above it will be seen that the greatest confusion has arisen as to the meaning of the term "Monilia"; in fact the words of Linnæus, in his "Philosophia Botanica, 1751," page 241—

"Fungorum ordo in opprobrium artis etiamnum Chaos est, nescientibus botanicis in bis quid species, quid varietas sit."

may be quoted as referring to the monilia of to-day.

We therefore follow Castellani and Chalmers in the third edition of their Manual where, on page 908, they are in accord with Vuillemin, who says that Saccardo's nomenclature should be the basis for all fungi, and therefore we adopt *Monilia* Persoon 1797 as the name for present use, but we also adopt the definition given on page 1079 of Castellani and Chalmers' third edition, viz.:—

"*Monilia Persoon*, 1797:—*Oosporaceæ*, possessing *in situ* budding forms and mycelial threads, which later are often long and branched, *in nature* with sporophores simple or subsimple, producing by constriction at their extremity a chain of large lemon-shaped spores, often provided with a disjunction apparatus, *in cultures* producing mostly budding forms, but sometimes filaments, in which thallospores of the blastospore type are found and fermenting glucose, and often other carbohydrate media with the production of gas."

The type species is most difficult to decide and *Monilia albicans* (Ch. Robin 1853) would be the suitable form because it is well known and can easily be studied, but according to Magalhaes, Vuillemin has found asci in old cultures of this parasite. If this is correct it will belong to the Ascomycetes, but Castellani has shown that there are a number of forms grouped under this name, and therefore if it is taken to be the type it must be used in the restricted sense defined by Castellani, i.e., without asci, liquefying gelatine and clotting milk, and forms which do not agree with this must be considered as belonging to other genera.

Having now cleared the position of the fungus and one of the diseases with which some of its species are associated, we may turn to consider the cases in the Sudan and Egypt from which we obtained the fungi we are about to describe.

Sudan Cases.—The primary infections which we have met with in the Sudan have, so far, belonged to the mild type of the disease. The yeast-like organisms may, or may not, be found with ease in the sputum, and figure 1 depicts their appearance therein. We will now give a short account of the common type which we have found in Omdurman and Khartoum.

Omdurman Type.—The following case occurred in the practice of Dr. Haddad in Omdurman. The patient, a native of the Sudan, was taken ill on June 28 of this year, suffering from fever: temperature 103° F., severe cough, and profuse greenish, fœtid expectoration. On examination of the chest moist râles were heard all over the lungs on both sides. On the right side between the angle of the scapula and the base there was some dullness, and crepitant râles were present. The sputum was

sent to us for examination. No tubercle bacilli, spirochætes, or pneumococci could be found, but a yeast-like organism was present which when grown was found to be a monilia, as will be described below.

The patient was treated with a mixture containing potassium iodide, and in the course of some fifteen days became convalescent.

Organism.—With regard to the organism, it was easily obtained in pure culture by inoculating a tube of Sabouraud's maltose agar, picking off a surface portion of the resulting twenty-four hours' growth and subinoculating on to another tube of maltose agar.

The pure growth was diffuse, and white in colour (fig. 3), and this could be obtained by aërobic and anaërobic methods of cultivation.

When examined under the microscope it showed typical yeast-like forms (fig. 2), which measured from 5·6 to 8·4 microns in length and about 2·8 microns in breath, as well as longer or shorter, straight or branched hyphæ, usually about 2·1 microns in breadth, as depicted in fig. 4. Older cultures, even up to eight weeks, never showed any formation of asci.

This organism was Gram-positive but not acid-fast.

It grew well on most solid laboratory media, including potato, but preferred those with an acid reaction or containing a sugar, and in all produced diffuse whitish growths similar to fig. 3.

It grew on gelatine and inspissated ox-blood serum, which it did not liquefy or discolour. When grown in liquids, such as broth or peptone water, the media remained clear with a deposit, while a pellicle was produced in peptone water.

Its qualitative biochemical reactions may be tabulated as follows:—

(1) *Monosaccharides*:—
  (*a*) *Hexoses.*—Acid and gas in *Glucose* and *Lævulose* (Fructose), but no acid or gas in *Galactose*.
  (*b*) *Pentose.*—No acid or gas in *Rhamnose* (Isodulcite).
(2) *Disaccharides*:—
  No acid or gas in *Maltose*, *Lactose* or *Saccharose*.
(3) *Trisaccharide*:—
  No acid or gas in *Raffinose*.
(4) *Polysaccharides*:—
  No acid or gas in *Dextrin*, *Inulin* or *Amylum* (starch).
(5) *Alcohols*:—
  (*a*) Trihydric.—No acid or gas in *Glycerol*.
  (*b*) Tetrahydric.—No acid or gas in *Erythrol*.
  (*c*) Pentahydric.—No acid or gas in *Adonitol*.
  (*d*) Hexahydric.—No acid or gas in *Dulcitol* or *Mannitol*.

The acidity was tested quantitatively in all the media mentioned above, but the only acid present was that found in glucose and lævulose, when the amount expressed in cubic centimetres of N_2O KOH, after deducting any found in the controls, was:—

Glucose	...	...	...	2·1 c.c.
Lævulose	...	...	...	1·3 c.c.

It was, however, observed that if kept for any length of time in liquid carbohydrate media, this fungus was apt to produce alkalinity, which of course diminished the acidity found in the glucose and lævulose media in proportion to the age of the culture.

It produced neither acidity nor clot in *milk*, which in the long run became alkaline. It did not reduce *nitrates*, nor produce *indol*, while the *Voges-Proskauer reaction* was negative.

It was insufflated into the nose of a guinea-pig and a broncho-pneumonia produced, from which the animal died.

Classification.—It is obvious that the organism which we are considering belongs to the subdivision *Fungaceæ* Linnæus 1737, because it has a vegetal cellular structure without much differentiation, reproduces by spore formation, and is without chromidiophores or chlorophyll.

As the vegetative body contains yeast-like cells and filaments (figs. 2 and 4), it belongs to that section of the Fungaceæ which is called *Eumycetes* Schroeter 1892.

As the hyphæ are not continuous in the vegetative stage (fig. 4), and as the spores are neither enclosed in asci nor in basidia, it belongs to the class *Fungi imperfecti Fuckel* 1869.

As its sporophores are not found in closed or open receptacles it is placed in the subclass *Hyphales* Vuillemin 1910.

As the mycelium is not composed of fine bacilliform hyphæ (fig. 4), and as the spores are thallospores, i.e., are in certain stages only portions of the thallus secondarily adapted for reproduction (fig. 2), it belongs to the order *Thallosporales* Vuillemin 1910.

As the particular form of thallospore present is developed from the summit (fig. 7) or sides of a hypha by budding, it is classified in the suborder *Blastosporineæ* Vuillemin 1911.

As the hyphæ in certain stages are not manifestly different from the spores, i.e., in the yeast-like stage (fig. 2), while a carbohydrate-like glucose is fermented, it belongs to the family *Oosporaceæ* Saccardo 1886.

As there are numerous budding forms in cultures (fig. 2), and as glucose is completely fermented with the production of acid and gas, it is placed in the genus *Monilia* Persoon 1797.

As gas is produced only in glucose and lævulose it comes under the second group of the species of *Monilia*, called the *Krusei group*, and as it produces neither acidity nor clot in milk it is recognized to be *Monilia krusei* (Castellani 1909), synonyms *Saccharomyces krusei* Castellani 1909, *Endomyces krusei* (Castellani 1909).

It was first found by Castellani in the sputum of cases of bronchomycosis in Ceylon. In sputum

it has a yeast-like appearance (like fig. 1), but in cultures hyphæ appear (fig. 4). Castellani has found that its characters remain constant after ten years of subculturing.

The characters of the original strain resemble those given above except that our variety, cultured for several days, produced a small amount of alkalinity, as mentioned above, in carbohydrate media and formed a pellicle on peptone water, which, however, are only minor points.

Khartoum Case.—This case is representative of the mild type as seen in Khartoum. It occurred in the practice of Dr. Malouf. The patient is a native of the Sudan, aged about 25 years, and by occupation a servant. He seems to have been indisposed at times during the last three years. An attack begins with fever (temperature about 103° F. and pulse rate about 120), associated with a very persistent cough and a whitish frothy expectoration which becomes greenish on the second day. When examined during such an attack moist râles can be heard all over the chest. He was treated with potassium iodide, with highly satisfactory results.

When the sputum was examined during an attack it was found to contain a fungus agreeing in all particulars with that found in the Omdurman case. Even the amount of acidity formed in glucose and lævulose was comparable, being respectively 2·1 c.c. and 0·9 c.c. in terms of N_2O KOH.

The causal organism is therefore *Monilia krusei* (Castellani 1909).

First Egyptian Case.—The case in question well exemplifies the graver type of the disease. It occurred in the practice of Dr. Farah, of Alexandria, and as he intends to publish a full statement of the case we will content ourselves with a mere outline of the valuable and careful clinical and pathological history which he has sent to us.

The patient is a well-to-do manufacturer, aged about 57 years, who seems to have had hæmoptysis for three days only when a young man and to have remained free from chest symptoms until August, 1917, but since that date has suffered from a series of attacks of fever associated with hæmoptysis or rusty sputum. During an attack the cough becomes severe and is at first dry and associated with fever, but after a few days the temperature drops and an attack of hæmoptysis occurs followed by abundant rusty sputum, which, when carefully examined by Dr. Crindiropoulo, of Alexandria, was found to contain neither tubercle bacilli, pneumococci, streptococci, Castellani's spirochætes or *Paragonimus ringeri*, but in which a yeast-like organism of the Monilia type could readily be seen. During an attack the patient, strange to say, does not feel very ill.

In the intervals between an attack and prior to treatment the temperature seldom became quite normal. These repeated attacks appear to have caused some anæmia, as his erythrocytes numbered 4,500,000 per cubic millimetre, while his hæmoglobin is only 55 per cent.

His leucocytes numbered 11,600, and were divisible into polymorphonuclear leucocytes 73·5 per cent., mononuclear leucocytes 3·1 per cent., eosinophile leucocytes 2·0 per cent., lymphocytes 17·3 per cent., and transitional cells 4·1 per cent.

As regards physical signs, the left lung exhibited a considerable area of dullness, with diminished vocal fremitus in its upper part and abolition thereof at the base. Subcrepitant râles could be heard only in the axillary region. No friction sounds, however, were noticed. The right lung does not appear to have been affected at any time.

The patient was markedly improved by injections of Lafay's Lipiodol, which was given in series of daily injections of 2 c.c. for four consecutive days, repeated after longer or shorter intervals. The Monilia disappeared from the sputum under this treatment and the patient was considerably benefited, but the fungus reappeared after cessation of the drug for some time and was followed by a slight return of the symptoms, which are being energetically treated on the above lines.

This is a very severe case and it is too early to say what the result will be, but there can be no doubt that Dr. Farah's treatment has greatly relieved the patient's symptoms, and probably prolonged his life.

Organism.—Cultures from the sputum were so carefully sent to these laboratories that we had no difficulty in obtaining pure growths on which the following observations are based:—

The fungus grew well at 37° C. on acid and sugar media giving rise to diffuse white growths (fig. 5). At first we only observed yeast-like forms (fig. 6), many of which were more or less circular, while others measured from 2·5 to 10·5 microns in length by some 2·8 to 7 microns in breadth, but after a time shorter or longer hyphæ (fig. 7), measuring about 1·75 microns in breadth, appeared but we never observed ascal formation. The fungus is Gram-positive but not acid-fast.

It grows well aërobically and anaërobically on solid and liquid media, but it does not liquefy gelatine or inspissated ox-blood serum, while broth and peptone water remain clear with a deposit at the bottom of the tube. No pellicle was formed on peptone water. It produces a thick white growth upon potato (fig. 9).

Its qualitative biochemical reactions may be tabulated as follows:—

I. Monosaccharides:—

(*a*) *Hexoses.*—Acid and gas in *Glucose* and *Lævulose* (Fructose) but no acid or gas in Galactose.

(*b*) *Pentose.*—No acid or gas in Rhamnose (Isodulcite).

II. Disaccharides:—

Acid and gas in *Maltose* but no acid or gas in *Lactose* and *Saccharose* (for quantitative determination in this sugar see below).

III. Trisaccharide:—

No acid or gas in *Raffinose.*

IV. Polysaccharides:—
No acid or gas in *Dextrin* (for quantitative determination see below), *Inulin* or *Amylum* (starch).

V. Glucose:—
No acid or gas in *Salicin*.

VI. Alcohols:—
(*a*) Trihydric. No acid or gas in *Glycerol*.
(*b*) Tetrahydric. No acid or gas in *Erythrol*.
(*c*) Pentahydric. No acid or gas in *Adonitol*.
(*d*) *Hexahydric*. No acid or gas in *Dulcitol* or *Mannitol*.

The acidity was tested quantitatively in all the media mentioned above and in terms of N_2O KOH was found to be as follows:—

Glucose	...	...	...	0·8 c.c.
Lævulose	...	...	...	0·6 c.c.
Maltose	...	...	...	0·9 c.c.

With regard to saccharose and dextrin only 0·1 c.c. was obtained and this was considered to be negligible as it would not appear in ordinary methods of determining acidity.

The fungus did not reduce *nitrates*, produce *indol*, or give the *Voges-Proskauer reaction*, while it produced no acidity and no clot in *milk*.

Twice we have attempted to infect monkeys of the species *Lasiopyga callitrichus* (I. Geoffroy 1851) without success by repeated insufflations through the nose and mouth.

The causal relationship to the disease seems to be supported by Dr. Crindiropoulo's observations on the positive agglutination and complement deviation produced by the patient's serum.

Classification.—By the process detailed above under the Sudan cases it is possible to determine that the organism in question belongs to the genus *Monilia* Persoon 1797.

As it produces acid and gas in glucose, lævulose and maltose it belongs to the third group of the species, viz., the pinoyi group, and as it does not produce acid and clot in milk it is *Monilia pinoyi* (Castellani 1910), synonym *Endomyces pinoyi* Castellani 1910.

This fungus was first found in the sputum of cases of Bronchomycosis by Castellani in Ceylon in 1910.

Our variety agrees with Castellani's original organism in all details except the slight amount of acidity obtained by quantitative methods in saccharose and dextrin, and therefore we conclude that it is the same organism as Castellani's *Monilia pinoyi*.

Second Egyptian Case.—We have found exactly the same organism in another Egyptian case of a similar nature.

Third Sudan Case.—We have also met with *M. pinoyi* in the Sudan in a milder case.

The quantitative sugar reactions of the pinoyi strains may be of interest:—

Sugar	Case I	Case II	Case III	Gas
Glucose ...	0·8	0·8	0·4	... Present
Lævulose ...	0·6	0·3	0·3	... Present
Maltose ..	0·9	1·0	1·0	... Present

All the other carbohydrate-alcohol reactions were negative. In regard to saccharose and dextrin only the first strain produced traces of acidity not exceeding 0·1, and as the other two did not the suggestion to treat this as negligible is supported.

None of the three strains produced acidity in litmus milk, on the contrary all three strains eventually produced alkalinity. We may therefore conclude that we have demonstrated the presence of *Monilia pinoyi* in the Anglo-Egyptian Sudan and in Egypt.

Fourth Sudan Case.—The patient is a Sudanese in the practice of Dr. Haddad, of Omdurman. During the last six months he has suffered from fever at intervals and from profuse expectoration during three months, but there has never been any hæmoptysis. Musical râles can be heard on both sides of the chest and some crepitant râles about the right apex. Repeated attempts to find the tubercle bacillus by digestive and microscopical methods as well as by animal inoculations have so far proved negative, but there is a non-acidfast fungus, belonging to the *Microsphonales*, always present, which so far has resisted all attempts at cultivation, so that the Monilia infection may be secondary and not primary.

Organism.—Microscopical preparations made from the sputum and stained in the ordinary way showed typical yeast-like bodies (fig. 1). Cultures were made on maltose agar and from these pure growths were in due course obtained.

The organism grew well both aërobically and anaërobically at 37° C. as well as at 22° C.

On maltose agar at 37° C., a circumscribed raised white growth appeared (fig. 12). When examined microscopically these cultures showed numerous yeast-like bodies measuring from 5·6 to 9·8 microns in length and about 3·5 microns in greatest breadth. Many filaments (fig. 11) were also to be seen measuring about 2·8 microns in breadth. The fungus is Gram-positive but not acidfast and grows well on solid and liquid laboratory media, but prefers those with an acid reaction or containing a carbohydrate.

It grows on gelatine at 22° C. and on inspissated ox-blood serum at 37° C., but it does not liquefy or discolour these media. When cultivated in broth or peptone water it does not form a pellicle. Its qualitative biochemical reactions are as follows:—

I. Monosaccharides:—
(*a*) *Hexoses*.—Acid and gas are produced in Glucose and Lævulose, but not in Galactose.
(*b*) *Pentose*.—No change is made in Rhamnose (Isodulcite).

II. Disaccharides:—
There is no change in Maltose or Lactose, but acid and gas are produced in Saccharose.

III. Trisaccharide:—
There is no change in *Raffinose*.

IV. Polysaccharides:—
No change is produced in *Dextrin*, *Inulin* or *Amylum*.

V. Glucoside:—

Salicin undergoes no fermentation.

VI. Alcohols:—

No change is produced in Glycerol, Erythrol, Adonitol, Dulcitol or Mannitol.

The quantitative amount of the acidity produced, represented in the usual terms, was:—

Glucose	...	...	...	2·0 c.c.
Lævulose	...	...	...	0·6 c.c.
Saccharose	...	...	...	2·0 c.c.

Compared with the quantitative results given by other Monilias at the same time in the same batch of reagents the amounts in glucose and saccharose are high.

With regard to the biochemical reactions the fungus produced acid and clot in *milk* and reduced *nitrates*, but did not form *indol* or give the *Voges-Proskauer reaction*.

Classification.—It is sufficiently obvious that the organism belongs to the genus *Monilia* and as it produces acid and gas in Glucose, Lævulose and Saccharose and in no other such reagent it is to be placed in Group VI. The *Guillermondi Group*, which contains only two species, *M. guillermondi* and *M. pseudoguillermondi*.

They are distinguished from one another by their reactions in milk in which *M. guillermondi* produces either no change or alkalinity and *M. pseudo-guillermondi* gives rise to acidity and clotting.

As our organism produces acid and clot it is *M. pseudoguillermondi*, and this is supported by the fact that it does not produce slight acidity in maltose or acidity in galactose which *M. guillermondi* does.

Summary.—The point which we have endeavoured to demonstrate in this note is that Bronchomycosis in the form of *Bronchomoniliasis* exists in the Anglo-Egyptian Sudan and in Egypt as a primary infection in its mild and severe forms and also a secondary infection. Further, we have demonstrated the presence of *Monilia krusei* (Castellani 1909), *Monilia pinoyi* (Castellani 1910), and *Monilia pseudoguillermondi* (Castellani 1916), in cases of disease in these countries, and we are of the opinion that further researches in these and other tropical and sub-tropical, and even perhaps temperate, climates may reveal that Bronchomycosis in some form is not rare.

With this idea in front of us it may perhaps be admissible to invite especial attention to the method of diagnosis which we adopt.

Diagnostic Methods.—The first essential is to obtain the sputum as fresh as possible from patients who have washed their mouths thoroughly with boiled or sterilized water.

This fresh sputum is first examined for *Castellani's Bronchial Spirochætes* by means of dark ground illumination, or in the case of out-stations by dried films of the fresh sputum being forwarded to the laboratories, where they are stained by Tribondeau's modification of Fontana's silver method of demonstrating spirochætes. The sputum is also submitted to simple microscopical examination with a view to the exclusion of lung parasites, such as *Paragonimus ringeri* (Cobbold 1880).

The sputum (preferably the twenty-four hours' collection) is digested in 3 per cent. solution of caustic soda at the temperature of the laboratory 90° to 100° F.) for twelve hours and then centrifuged. Films are then prepared from the deposit and stained by one of the usual methods of demonstrating acid-fast bacilli. By this procedure the *tubercle bacillus* and the acid-fast species of *Nocardia* may be distinguished. In place of this method a similar procedure described by Greenfield and Anderson in the *Lancet* of September 6, 1919, may be adopted. In special cases we always inoculate a guinea-pig so as to definitely exclude tuberculosis. Cultures are also made for the purpose of differentiating the tubercle bacillus and the Nocardias.

Other films of the fresh sputum are coloured by Leishman's and by Gram's methods with the intent of revealing the presence of the non-acidfast species of *Nocardia* and of *yeast-like fungi*.

In the meanwhile cultures of the fresh sputum are made upon Sabouraud's maltose agar and the twenty-four hours old growth examined for yeast-like organisms which, if present, are subinoculated on to other slants of maltose agar in order to obtain pure cultures. It is easy to define a *Monilia* when isolated by this method.

Causal Agency.—That the organism is related to the disease may at times be supported by agglutination, and complement deviation experiments with the patient's serum and by animal infections, but not always. Secondary infections also occur.

Treatment.—The sheet anchor of the treatment is potassium iodide by the mouth or its equivalent in the form of intramuscular injections of which Lipiodol as used by Dr. Farah certainly deserves an extended trial in severe cases.

Post-mortem Examination.—Post-mortem observations are still required to complete the history of the disease.

Acknowledgments.—We beg to acknowledge gratefully the kind assistance given to us in this work by Dr. Farah of Alexandria and by Drs. Malouf and Haddad of the Anglo-Egyptian Sudan.

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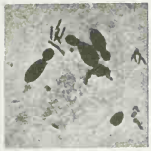

Fig. 1.

Fig. 3.

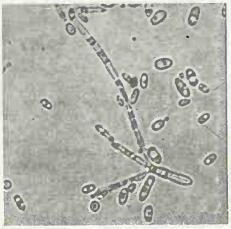

Fig. 4.

Fig. 5.

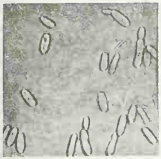

Fig. 2.

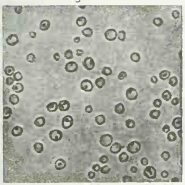

Fig. 6.

Fig. 7.

Fig. 8.

Fig. 9.

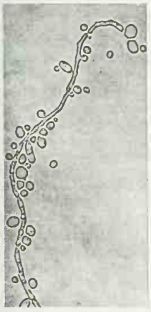

Fig. 10.

Fig. 11.

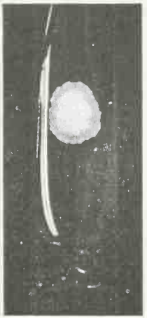

Fig. 12.

To illustrate paper on "Bronchomoniliasis in the Anglo-Egyptian Sudan and Egypt," by ALBERT J. CHALMERS, M.D., F.R.C.S., D.P.H., and NORMAN MACDONALD.

FIG. 1.

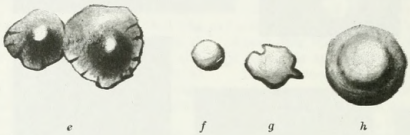

FIG. 2.

FIG. 3.

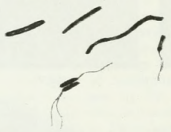

FIG. 4.

FIG. 5.

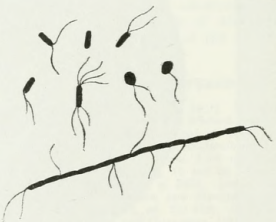

FIG. 6.

To illustrate paper on "Some Observations on *Vibriothrix zeylanica* (Castellani)," by LUDWIK ANIGSTEIN, M.D., Ph.D.

ILLUSTRATIONS.

FIG. 1.—Yeast-like forms of *Monilia pseudoguillermondi* as seen in sputum after staining with thionin blue. Photomicrograph × 400 diameters.

FIG. 2.—*Monilia krusei.* Yeast-like forms from a twenty-four hours old culture on Sabouraud's maltose agar at 37° C. Photomicrograph × by 400 diameters.

FIG. 3.—*Monilia krusei.* Culture on Sabouraud's maltose agar at 37° C. for four days. Photograph about natural size.

FIG. 4.—*Monilia krusei.* Hyphæ and spores from a seven days' culture in peptone water. Photomicrograph × 400 diameters.

FIG. 5.—*Monilia pinoyi.* Culture on Sahouraud's maltose agar at 37° C. for four days. Photograph about natural size.

FIG. 6.—*Monilia pinoyi.* Yeast-like forms from a twenty-four hours old culture on Sabouraud's maltose agar at 37° C. Photomicrograph × 400 diameters.

FIG. 7.—*Monilia pinoyi.* Yeast-like forms with commencing hyphæ from a twenty-four hours old culture on Sahouraud's maltose agar. Photomicrograph × 400 diameters.

FIG. 8.—*Monilia pinoyi.* Hyphæ from culture on Sabouraud's maltose agar after three and a half months' growth at 37° C. Photomicrograph × 1,000 diameters.

FIG. 9.—*Monilia pinoyi.* Culture on potato at 37° C. for seven days. Photograph natural size.

FIG. 10.—*Monilia pinoyi.* Hyphæ and spores from a seven days old culture in peptone water at 37° C. Photomicrograph × 400 diameters.

FIG. 11. *Monilia pseudoguillermondi.* Hyphæ and spores from four days old culture in peptone water. Photomicrograph × 400 diameters.

FIG. 12.—*Monilia pseudoguillermondi.* Culture on Sabouraud's maltose agar at 37° C. for four days. Photograph about natural size.

SOME OBSERVATIONS ON *VIBRIOTHRIX ZEYLANICA* (CASTELLANI).

By LUDWIK ANIGSTEIN, M.D., PH.D.

(From the Central State Epidemiological Institute, Warsaw, Poland. Director: Dr. L. RAJCHMAN).

THE opportunity of investigating a strain of *Vibriothrix zeylanica* was given to me by Professor Aldo Castellani, who some time ago kindly offered to the Central State Epidemiological Institute in Warsaw a collection of very interesting cultures of bacteria prevalent in tropical countries. Castellani isolated "*Vibriothrix zeylanica*" from dysenteric fæces in 1904.

The several synonyms of this organism (*Spirobacillus zeylanicus, Spirillum zeylanicum, Vibrio zeylanicus, Vibriothrix zeylanica*) tend to show that it has not yet found a definite place in the classification of vegetal organisms. Its classification is difficult owing to its peomorphism as well as to the fact that important morphological characteristics have not been defined clearly until now.

The organism, which is very motile, gives an abundant growth on ordinary agar, in dextrose agar, in broth and in 1 per cent. peptone water. In liquid media a pellicle is formed on the surface, while the liquid itself becames turbid after twenty-four hours at 37° C. A precipitate consisting of the bacteria is formed at the bottom of the tubes.

On agar plates round, transparent, bluish colonies appear, which closely resemble colonies of *B. shiga* —a fact to which attention was drawn by Castellani in 1910. The larger colonies lose in time their transparency and become greyish in tint.

Under a magnification of 28 diameters a diversity in shape of the colonies can be noted. The surface of the small semicircular ones is smootb, the edges are usually straight, sbarply indented. Some of tbe smaller colonies present wavy edges. Tbe larger colonies assume a crater-like shape (fig. 1*a*), while some of them are flattened or even concave (fig. 1*b*). The shape of tbe colony can best be observed by reducing tbe lighting of the microscopic field under a magnification of 28 diameters, in reflected but not in transmitted ligbt. From the standpoint of structure the colonies may be described as small-granular uniform with darkened centre and clearer edges. On gelatine plates tbe smaller colonies appear as transparent droplets with a bluish tint; but in general the colonies formed on gelatine after six days at 22° C. seem smaller than on agar. They are uniform in appearance in so far as they are all semicircular with a regular sharp edge and a smooth surface.

BIOCHEMICAL PROPERTIES.

On Endo plates colonies of the vibriothrix do not differ from those of *B. shiga* and *B. typhosus* in so far as there is no change in colour. The fermentative properties of tbis strain have been described already by Castellani (1909). I can only confirm the fact that neither gas nor acid is formed in either mannite, maltose, dextrose, lactose or saccharose. In fact, the contrary action, i.e., the production of alkali can be noted. Indol is not produced (Kitasato-Salkowski method). Gelatine is not liquefied after seventy-two hours.

MORPHOLOGY.

The examination in a hanging drop shows a very actively motile organism. One notes a forward movement combined with a rotation round the axis of the organism.

When observed in dark field examination (Zeiss apochr. immersion, 1·5 mm., oc. 12) the rods show the presence of an intracellular very refractile polar granule. At times I succeeded in observing ultramicroscopically a fairly rapid rotation round the transversal axis of the rod. The above described somewhat complex active movements suggested the presence of definite organs of motility in the shape of cilia or flagella, though the dark field examination did not show the presence of any such organs.

In dried smears fixed by heat or methylated spirit and stained by either gentian-violet, crystal-violet or carbol-fuchsin, the organisms appear as uniformly stained slender bacilli, at times somewhat curved. They are stained best by crystal-violet (Benda) or by fuchsin. Side by side with the slender bacilli there may be noticed shorter forms considerably thicker and more deeply taking the stain. The first impression is that the culture might be impure. Any such doubt is however dispelled by using the classical method of Koch of

fractionated plating. Castellani himself has drawn attention already to the fact of this pleomorphy.

He has also mentioned the appearance on forty-eight hours' slant agar cultures, and particularly on the surface of broth-cultures, of long threads which resemble spirilla by their slow wavy movements. We shall learn presently that these threads consist each of a number of bacilli. In the older cultures the pleomorphy is most accentuated and globoid bodies can be observed ("formes coccoides" Castellani, figs. 5, 6). These cannot be spores, for they are all destroyed by the temperature of 60° C. three minutes.

In the selection of a technique for the study of the morphology of this strain I was guided by a fundamental assumption, that the vibriothrix must be endowed with organs of motility. By fixing the organisms while still alive I tried not to damage those assumed delicate formations. My technique consisted in the following: I took a minute particle of the growth on a slant agar tube with a platinum needle and I emulsified the material in one loopful of tap-water on a slide. I then mixed this emulsion with a drop of water containing 2 per cent. osmic acid in a proportion of 3 to 1. After some ten seconds the emulsion was smeared on cover-slips which had previously been flamed. All further procedures were carried out scrupulously according to the silver-impregnation method of Zettnow, as described in the "Lehrbuch der Bakteriologie," by Ludwig Heim, 1918, Stuttgart, p. 184.

The first trials were crowned with results which entirely supported the fundamental assumption. The majority of the bacilli were shown to possess one polar flagellum, while others exhibited one or two cilia at each pole (fig. 3). Only a few organisms did not show these formations. A great many cilia appeared free in the microscopic field, detached from the bacterial bodies. As regards the threads resembling spirilla or spirochætes (figs. 3, 5), in some of them there was at one end a darkly stained granule (basal body). One can notice in well-stained slides (Zeiss apochrom. 2 mm., oc. 12) that the free cilia consist of a number of minute granules in the form of beads. It has been mentioned that individual organisms with two cilia at each end may be met with. In particularly successful slides I was satisfied that I could see at every pole three to four cilia in one bunch (fig. 6). It is difficult however to find out their correct number owing to their extreme fragility and of the case with which they become detached from the bacterial bodies. It is possible that the number exceeds four.

The cilia are also present round the globoid bodies. I have noted some of these with two cilia on a joint basis (fig. 6). Such bodies, though not ciliated, were described by Almquist (2) in the course of his studies on *B. shiga*. He designated them by the name of "Conidia," assuming that they represented forms of evolution which appeared *in vitro* under unusual conditions. It is obvious that the motility of previously mentioned threaded rod formations is due to the presence of the cilia. Amongst those elongated forms one can notice in silver-stained preparations also some relatively short ones with uniform contents, while others appear considerably longer and consist of a series of bacilli, touching each other pole to pole. These threads are surrounded by a membrane which appears as a dark contour and figs. 4 and 5 show such forms consisting of several bacilli with a gap in their continuity, just as if these threads were empty at places. Other threads (fig. 6) consist of a series of bacilli solidly filling up the whole thread. One may assume that these threads are either forms of evolution or involution. In the latter instance one should expect their plentiful presence, particularly in old cultures, yet I have seen no elongated forms in ten weeks' old dried up slant agar cultures. Obviously it is difficult to settle this question on the ground of the above incomplete observations, but one may suggest that the threads represent one of the forms of evolution of this organism.

The *viability* of vibriothrix at the room temperature (10-14° C.) is fairly long, for abundant growth may be obtained on slant agar after eighteen hours' incubation when inoculated from a ten weeks' old dry agar culture. In fresh cultures the bacilli have a normal appearance, all of them showing the presence of cilia. On the other hand, in the ten weeks' old cultures there are numerous deeply stained polar bodies, the protoplasm of the majority of the bacilli being somewhat contracted. Practically all the bacillary forms were provided with cilia. In old cultures I have not observed any elongated forms.

To summarize the morphological characters, the vibriothrix may be described as a pleomorphic highly motile organism, provided with a membrane, with a bunch of cilia at each pole. There are no true spores and the organism has a tendency of growing into long bacillary forms or into threads consisting of a series of rods. It is Gram-negative.

The following table shows at a glance the principal morphological and biochemical characters:—

Length in μ	1·5—7·0
Cilia	+
Gram	−
Growth:	
Aerobic	+
Anaerobic	−
Liquefaction in gelatine	−
Growth in broth:	
Turbidity	+
Pellicle	+
Spores	−
Indol	−
Fermentative action on sugars and other carbohydrates	−

With regard to the toxicity and pathogenicity of the strain, it did not prove toxic in any way to laboratory animals and so far all experimental evidence as to its deleterious effects on man is lacking. This confirms the results obtained by Castellani. There remains to be investigated whether or not vibriothrix plays any rôle in secondary changes in

dysentery as, for example, in the formation of the ulcers. This germ should be looked for, particularly at the present moment, when large bodies of allied troops are returning from tropical or subtropical countries. The practical bacteriologist should bear in mind that the colonies of vibriothrix on superficial examination may be mistaken for those of *B. dysenteriæ* Shiga.

The two organisms however can be easily distinguished by the vibriothrix not fermenting any sugar, being very polymorphic and by being motile, and final proof may be obtained by using the silver staining method of Zettnow. It must be emphasized that the cilia to which the motility of vibriothrix is due are so extremely delicate that dark ground examination does not bring them into evidence.

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Explanation of the Plate.

Fig. 1 (a, b, c, d.)—Various colonies of Vibriothrix on agar-plate after twenty-four hours' incubation. Magnification 28 diam.

Fig. 2 (e, f, g, h.)—Colonies of Vibriothrix on Endo-Agar plate after twenty-four hours' incubation. Magnification 28 diam.

Fig. 3.—Vibriothrix Z. silver impregnation method (Zettnow). Isolated cilia, one with a polar (basal) body. Bacillary forms on slant agar culture after twenty-four hours' incubation.

Fig. 4.—Elongated bacillary form. Thread forms and bacillary form with polar bodies. Bacillary forms on slant agar culture after forty-eight hours' incubation (Zettnow method).

Fig. 5.—Globoid forms. Next to them isolated cilia. Long thread forms (Zettnow technique).

Fig. 6. Bacillary and globoid forms with cilia. "Thread" consisting of a series of bacilli. In some places cilia between the rod-like forms (Zettnow technique).

Magnification of figs. 3, 4, 5, 6; 1,500 diameters (Zeiss, immers.-apochrom., 2 mm., Comp.-Ocul. 12).

Protein Therapy of Typhus (F. Opazo, *Revista Médica de Chile*, August).—This method was applied in twenty-seven cases of typhus, with fourteen recoveries, four in convalescence and seven still under treatment; two of the patients died, but the disease in their cases had reached a stage when reaction was no longer possible. Protein therapy induced a favourable reaction which modified the disease and all the symptoms. The reaction was prompter and more effectual in children than in adults. Protein therapy is the routine treatment in all cases of typhus.

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THE JOURNAL OF

Tropical Medicine and Hygiene

JANUARY 1, 1920.

The Journal of Tropical Medicine and Hygiene enters its twenty-first year to-day. It was conceived, started, and edited and financed by Mr. (now Sir) James Cantlie in 1899; curiously enough, the same year as the London School of Tropical Medicine was opened, preceding that important

event by a few months only. It was the first journal of the kind ever instituted, and has had many imitators. Sir James carried the idea to many markets before he took upon himself the issue and the financial responsibility. He went to several publishers asking them to take the proposal up, but one and all said it was too great a risk, and that the subject was too limited in its scope to justify or require a journal of its own. He then went to the two leading medical journals in Britain and got the same answer, and was told that the best that they could do would be to publish an occasional Tropical Supplement to their issues consisting of four pages. Other medical journals were approached, but they also declined, chiefly on the score of finance. Disappointed in his endeavours, he revisited each of the publishers and proprietors of the journals to whom he had given the opportunity, and announced that as he could not find a publisher he meant to publish the Journal himself, and hoped that they would not denounce the idea because it might tread upon their preserves. Some of them indeed gave friendly advice in the matter, and he was warned that he would certainly incur a serious financial loss to begin with at any rate, which perhaps might prove ruinous in course of time. But, as Sir James himself put it, "Fools step in where, &c.," and without further ado proceeded to bring out the first number. It was, to begin with, a monthly Journal, and for some two years it remained at that. John Bale, Sons and Danielsson were entrusted with the printing and publishing, but they bore no monetary risk, Sir James paying all the expenses in launching, printing, and carrying on the production. It was altogether a bold undertaking and a grave financial burden that the founder shouldered, but those who know him are well aware that it was not the first, nor yet the last, scheme of the kind he has brought forward, cherished, established and carried to a successful issue; and in which financial matters were the last thing thought of or considered. His argument has always been, "It is a national duty that so-and-so be done, it is somebody's duty to do it, and if nobody will take it up, I will do it myself."

During the early days of the Journal Dr. W. J. R. Simpson, C.M.G., was an active help; in fact, Sir James waited for several months until Dr. Simpson came home from Calcutta, where he had been Editor of the *Indian Medical Gazette* for some years, and as the literature produced in that journal was akin to that likely to occupy the pages of the proposed JOURNAL OF TROPICAL MEDICINE, Sir James believed that he would be a most efficient help to him. Nor was he mistaken; for Dr. Simpson—now Professor Simpson, C.M.G., of King's College, London, and Lecturer in Tropical Hygiene and Sanitation in the London School of Tropical Medicine—proved a standby of incalculable value. The Journal proved fairly successful, but tropical medicine was not so appreciated nor so "fashionable" as it now is, and the circulation was limited to a degree. The number of copies after a time failed to show an increase; the advertisements by which, as we well know, most medical journals practically exist, were few; and it was difficult to persuade business men to come forward, as the number of copies sent out had to be guaranteed, and the small number in circulation was a serious detriment. The future of the Journal at one time seemed so hopeless that the friends of the founder advised him to give it up altogether before worse befell him. Most men would have listened to their evidently kind and honest advice; not so Sir James. The threatened ruin had the opposite effect, for instead of giving it up he proceeded to double the output, and in place of bringing out the Journal once monthly, he decided to publish it twice monthly: taking a gambler's chance, it may be said—neck or nothing. But the founder had had a long experience of men and matters, and what seemed recklessness to others is but in accordance with the experience of many men who, when the venture succeeds, are credited with foresight, perspicuity and all the attributes associated with ventures of successful men. This venture came under this category, and the Journal flourished from thence gradually and assuredly.

Yet another scheme brought forward by Sir James Cantlie enters into the tale of this Journal and its future. It was none other than the formation of a Society of Tropical Medicine and Hygiene for Britain and the Empire, to be a centre of information and a focal point at which men engaged in tropical practice might bring forward their ideas, reports of their doings, and afford a channel of discussion to all interested. Sir James drew up the constitution, this being the usual rules appertaining to societies of the kind, and named the first officers of the Society. With his usual magnanimity he left out his own name, and was content, as was his wont, to set the thing a-going. The officers appointed set to work to draw up new rules, so-called, which when completed were but *facsimiles* of the initial scheme in every detail, even to the names of the men who occupied the posts of the officers of the Society. The expenses of the newly formed Society were a serious question to begin with, until Sir James came forward and offered to publish the *Transactions* of the Society free of charge in the JOURNAL OF TROPICAL MEDICINE, and for twelve months this was done. At the end of that period, however, the Society published its own doings, and any possible benefit that might have accrued to his Journal was annulled and lost. It became evident to Sir James that it was hopeless to conduct a "one-man journal," as the Tropical Journal was styled, any longer. That the usual feelings, natural to mankind, would arise and interfere was certain, and they were soon forthcoming. Well aware of the feeling, Sir James determined for the sake of the Journal to part with the cherished child of his creation. He disposed of the proprietorship of the Journal to Messrs. John Bale, Sons and Danielsson,

of Oxford House, Great Titchfield Street, London. They had been kindly helpers and publishers from the first beginnings of the Journal, and he parted with it to them, knowing that it was passing into the hands of a firm of honest men, and one likely to carry on the furtherance of the subject he had at heart. The terms were simple. He invited Messrs. Bale to take it over, if they chose, at whatever price they thought was likely to be advantageous to them, that he was willing to accept their own valuation, and, as they alone knew what the Journal was worth, that the transaction be wholly left to them, and any sum they offered would be right. The only remonstrance Sir James made was that he thought his kind friends, Messrs. Bale, were too generous to him, and that their friendly feelings had outrun their commercial instincts. By this time other publishers were nibbling at tropical publications of a similar nature and threatening to swamp Sir James's effort, which, of course, was not without its detractors. He offered to withdraw his name from the title-page in the hopes that the "*one-man journal*" idea might be stifled and allayed. This, however, the new proprietors demurred to, and persuaded him to continue in his editorship. By-and-by other names began to creep into the group of the editorial staff as well as that of Professor Simpson, whose magnanimous help in early days remained. Sir Patrick Manson found it necessary, on taking up his appointment at the Colonial Office, to remove his. Dr. G. C. Low came on to the staff and afforded ready and most efficient help; and the heading on the front page of the Journal shows that several others of the great names in tropical medicine lent their active aid or their important names to the Journal.

The words "AND HYGIENE" were added to the original title of the Journal really to meet the name given to the newly raised Society of Tropical Medicine and Hygiene, and for other reasons which can be readily guessed at. The readers of the Journal will no doubt appreciate the interesting account here set forth; given before the tale is altogether forgotten or those concerned in it have left but a memory behind them. It seems expedient therefore, on this the twenty-first year of publication, to recount the early days of the Journal, which will flourish whilst tropical medicine attracts and exists as a vital part of the world's scientific work.

Two important names have been ranged alongside of the original founder with the issue of January 1, 1920—namely, Dr. Aldo Castellani and Dr. Albert J. Chalmers. This is as it should be, showing that younger men of world-wide reputation are taking up the cause of the tropical journal, and with the accumulated knowledge daily accruing along new lines of extended investigation the staff should be made more virile and varied.

M. B. C.

Annotations.

Filarial Periodicity.—In the *Journal of the Amer. Med. Assoc.*, of September 6, 1919, Lynch gives the results of some interesting experiments which in his opinion tend to confirm Rivas' mechanical theory of filarial periodicity. Rivas, as is well known, believes that the presence in large numbers of *Microfilaria bancrofti* in the cutaneous capillaries at night, principally from midnight to 8 a.m., is due to the gradual resumption of capillary tone, delaying the microfilariæ at the periphery, where they accumulate until they finally get through and are held up again in the pulmonary capillaries. Lynch has noticed that the administration of a dilator, such as nitroglycerine, causes a decrease in the number of microfilariæ in the peripheral capillaries during the period of prevalence, while the administration of a constrictor, such as epinephrin, has the opposite effect.

Leprosy in Uruguay (J. Brito Foresti, *Revista Medica del Uruguay*, January, 1919).—Leprosy is comparatively common in all South American countries except Chile. In Uruguay there are nearly 200 lepers in a population of a little over 1,300,000. In the author's experience chalmoogra oil and ichthyol are very beneficial, but in the acute febrile periods salicylate of soda should be administered.

Skin Diseases among the Porto Rican Troops (Herman Goodman, *New Orleans Medical and Surgical Journal*, vol. 72, No. 6, December, 1919).—The author has examined 7,000 men among the troops stationed in Porto Rico for presence of skin diseases. He has observed two typical cases of yaws, in which *Treponema pertenue* Castellani was found. Tinea flava, vitiligo, nevi, pyodermia and Tinea cruris were common affections. Alopecia areata was found once. Keloids were not frequent, and of psoriasis he saw only one case.

A Year's Experience of a Severe Epidemic of Malaria in the Mitidja (Algeria) (F. Senne Sergent, *Bull. de la Soc. de Path. Exotique*, v.l. x, No. 7, 1917).—Quinine has been systematically administered to the natives since 1906. Four or even two 8-gr. doses weekly give good results under normal conditions; but, during a severe epidemic, a daily course is more effective.

On the Rarity of Phlyctenular Conjunctivitis in the Algerian Aborigines (L. Parrot, *Bull. de la Soc. de Path. Exotique*, vol. xi, No. 7, 1918).—During ten years in Algeria the author only twice saw conjunctival vesicles, though pediculosis of the scalp, "scrofula," and impetigo are rife among the juvenile population. His experience and that of other writers fails to confirm P. de Font Réaulx's hypothesis that *Pediculus capitis* is the causal agent of phlyctenular conjunctivitis.

Note on Arrested Development and Infantilism of Malarial Origin in Algeria (H. Foley and L. Parrot, *Bulletin de la Soc. de Path. Exotique*, vol. xi, No. 10, 1918).—Though malaria causes few deaths among the native children, the dystrophic effects of the infection are strongly manifest. Latest investigations show that wherever malaria prevails in Algeria pseudorachitic and temporary or permanent infantilism are found. In earliest infancy the dystrophy is shown in general backwardness and enormous development of the abdomen in contrast to the emaciation of other parts; the typical symptoms of true rachitis are absent. In later childhood the same characteristics prevail and growth is much below normal. As puberty (often considerably delayed) approaches, the general condition improves, the symptoms of infantilism disappear, and the splenic hypertrophy abates; growth is rapidly resumed in many cases, in others it is long retarded, while in some the arrested development is permanent.

Current Literature.

Annals of Tropical Medicine and Parasitology.

Vol. XIII, No. 3, December 19, 1919.

Coincident Malaria and Enteric Fever (Henry Harold Scott).—The author calls attention to certain peculiarities which he has noticed in cases of coincident enteric fever and malaria. In his experience such cases generally run a mild course, and recovery is more rapid than in the case of either affection separately.

The Metabolism of White Races living in the Tropics: Composition of the Urine (William John Young).—According to the author's researches in North Queensland the daily volume of urine excreted is much less than in Europe, the specific gravity higher, while the freezing point is approximately the same. The quantity of sodium chloride excreted in the urine is very low. The total nitrogen also shows a lower figure than that found in Europe, and this cannot be explained by loss of nitrogen from the skin, which amounts only to 1 or 2 grm. daily. A trace of albumin is frequently present, especially in men.

On the Endemic Tsutsugamushi Disease of Formosa (Juro Hatori).—The disease as met with in Formosa seems to be clinically very similar or identical with the type observed in Japan. It is transmitted by the same red mite, the larva of *Trombicula* (*Leptus*) *akamushi* Brumpt, and certain species of monkeys can be infected experimentally. With regard to prophylaxis the author recommends as the most important measure to bring the lands infested with the mites under cultivation. People entering the infected areas should wear mite-proof suits. Sulphur lotions are occasionaly useful.

Notes on the Bionomics of Stegomyia fasciata, Fabr. (J. W. Fielding).—A complete investigation of the bionomics of this mosquito in Australia. Among many other interesting observations, the author has noted that batches of mosquitoes which were given food other than blood never laid eggs except when fed on concentrated peptone and sugar solution.

Ankylostoma ceylanicum in the Cat in Durban (B. Blacklock).—Several ankylostoma worms were collected by Dr. I. G. Canston from the gut of a cat in Durban and sent to the author, who describes them as female specimens of *A. ceylanicum* Loos.

Indian Medical Gazette.

Vol. LIV, No. 10, November, 1919.

Cholera Prophylactic Vaccination: An Experiment in a Village during an Epidemic (Ashtosh Roy).—The author succeeded in arresting a severe epidemic in a village by inoculating with cholera vaccine practically all the inhabitants, including children.

The Economic Value of Anticholera Inoculation (T. C. McCombie Young).—The author, who is Sanitary Commissioner, Assam, suggested to the authorities that all labour recruits for Assam should be inoculated with cholera vaccine before their despatch from the recruiting agencies. The result was very satisfactory, the incidence of cholera among the emigrants on the transit routes became very small and it was not found necessary to restrict emigration, a step which would have had a very serious economical effect on the tea industry of the country.

Diabetes in Madras (S. Krishnamurti Aiyer).—The author emphasizes the necessity of further investigation of diabetes in South India.

A Case of Ophitoxæmia (D. J. Asana).—A native woman, 50 years of age, bitten by a poisonous snake (*Echis carinata*), was successfully treated with calcium chloride internally and hypodermic injections of emetine hydrochloride.

Paka Oil in Mustard Oil as an Adulterant (Rai Chunilal Bose and Satyendra Nath Sen).—Several cases of poisoning due to the admixture of paka oil with edible mustard oil have recently occurred in Bengal. The authors have found out that hydrocyanic acid, probably derived from some form of cyanide glucosides, is present in paka oil.

Quarterly Journal of Medicine, Oxford.

No. 49, October, 1919.

Treatment of Malaria (J. Cowan and R. H. Strong).—The authors believe that certain cases of so-called chronic malaria are in reality cases of chronic quinine poisoning. In their opinion, in a number of cases, quinine, even given in large doses, does not cure the disease. They recommend the use of arsenical preparations.

Pulmonary Manifestations in Malaria (A. W. Falconer).—Malaria, as already noted by previous observers, may affect the respiratory system, and

there may be present physical signs of bronchitis, partial consolidation or massive collapse of the lung, without any evidence of superadded pneumococcus infection.

THE JOURNAL OF EXPERIMENTAL MEDICINE,

Vol. XXX, No. 5, November 1, 1919.

Chemotherapy of Trypanosome and Spirochæte Infections (N-phenylglycineamide-p-arsonic Acid), by Walter A. Jacobs and Michael Heidelberger.—This paper deals with the substance N-phenylglycineamide-p-arsonic acid purely from a chemical aspect.

Chemotherapy of Trypanosome and Spirochæte Infections; The Toxic Action of N-phenylglycineamide-p-arsonic Acid, by Wade H. Brown and Louise Pearce.—According to the authors' experiments, the drug lends itself to almost any method of administration and can be given to the lower animals in very large doses. The reaction of the animals to toxic doses of the drug is of favourable character, the recovery of the animals from sublethal intoxication being remarkably rapid and complete. Very large doses can therefore be given at short intervals, and such a degree of tolerance is developed in the animals that the dose can be progressively increased to a point well over what is fatal to a normal animal. This is a feature of the greatest significance as regards the use of the drug for therapeutic purposes.

The Therapeutic Action of N-phenylglycineamide-p-arsonic Acid in Experimental Trypanosomiasis of Mice, Rats and Guinea-pigs, by Louise Pearce and Wade H. Brown.—The authors give accounts of the same substance as used in curative treatment on mice, rats and guinea-pigs. The results were highly satisfactory, it being especially noted that the animals appear to benefit in their general health from the injections.

Chemotherapy of Trypanosome and Spirochete Infections. The Therapeutic Action of N-phenylglycineamide-p-arsonic Acid in Experimental Trypanosomiasis of Rabbits, by Louise Pearce and Wade H. Brown.—The authors give a detailed description, accompanied by plates, of their experiments in the treatment of experimental trypanosomiasis of rabbits. The authors again note that the injections are followed by a marked immediate improvement in the animal's general condition.

Chemotherapy of Trypanosome and Spirochæte Infections: The Action of N-phenylglycineamide-p-arsonic Acid upon Spirochætic Infections, by Wade H. Brown and Louise Pearce.—The authors conclude that N-phenylglycineamide-p-arsonic acid is capable of exercising a very definite effect upon the course of infections produced by spirochætes of the recurrens group and by *Treponema pallidum* (Schaudinn). With either group of organisms N-phenylglycineamide-p-arsonic acid appears to act in a manner somewhat different from that of the usual spirochæticidal agents. While it does possess a considerable degree of spirochæticidal action its chief effect is seen in the peculiar manner in which it modifies or controls the course of these infections.

The Occurrence of Bacillus influenzæ in the Normal Throat, by Agnes I. Winchell and Ernest G. Stillman, M.D.—The authors have made further investigation into the occurrence of *Bacillus influenzæ* in throats and saliva. They conclude that *B. influenzæ* Pfeiffer may persist in the throats of healthy carriers both during and after an epidemic of influenza. The bacillus has been found in the throats of a considerable number of individuals not exposed during the epidemic. The bacillus can best be cultivated on oleate hæmoglobin agar medium.

BULLETIN DE LA SOCIETE DE PATHOLOGIE EXOTIQUE, Vol. XII, No. 8, November, 1919.

The Leucocytic Formula in the Human Spirochætosis of the Middle Congo (A. Lebœuf and A. Gambier).—The twenty-two patients from whom the material was taken were all suffering from spirochætosis with presence of the organism in the blood. The only abnormality observed in the counts was the disappearance of the eosinophils, the average percentage being 0·94 (as against an average of 8·43 in the apparently healthy native, though all of them harbour intestinal worms), while in ten cases there were none at all. Complete disappearance of eosinophils in an aborigine of the Middle Congo suffering from fever of obscure origin may, therefore, in the authors' opinion, be regarded as symptomatic of spirochætosis.

Ornithodorus Moubata in the North Eastern Districts of Belgian Congo (J. Bequaert, *Bull. de la Soc. de Path. Exotique*, October 8, 1919).—Though this tick has not been identified in the villages and encampments situated on the banks of the Arouwimi and Itouri rivers and their tributaries, it is very common in the villages of the Walendou plateau. It is present at Beni and infests Kasindi, an important frontier station north of Lake Albert Edward, and is probably to be found in all the forest-free regions between the two. Its advent in the latter district is recent and apparently dates back to 1902-4, but the immunity of the aborigines of the Walendou plateau to the infection it conveys (relapsing fever) indicates its presence there for very many years. The Walendou may, indeed, be considered as one of the original points of habitation of the tick.

Note on the Ætiology of Oriental Sore in Mesopotamia (Major W. S. Patton, M.B.Edin., F.E.S., I.M.S., *Bull. de la Soc. Path. Exotique*, October 8, 1919).—The author believes that Oriental sore is acquired by rubbing *Herpetomonas phlebotomi* into the skin when crushing an infected sand-fly in the act of biting, but he failed to prove this in his own case, perhaps because he had previously been infected. He suggests that others on the spot should try the experiment of dissecting out the alimentary tracts of sand-flies, selecting an infected hind gut and rubbing this into the skin at a marked spot; at the same time it should be noted whether the

specimen has ingested the blood of the gecko, for the theory has been advanced that this lizard is the natural reservoir of the parasite of Oriental sore.

Two Cases of Milk-pox or Alastrim observed at Brazzaville (Middle Congo) (A. Lebœuf and A. Gambier, *Bull. de la Soc. de Path. Exotique*, October 8, 1919).—The second case was admitted to hospital nine days after the first, and both ran an identical course. The condition differed from chicken-pox in the appearance of the vesicles and scabs, and from small-pox in the mild character of the general symptoms, as well as the nature of the pustules. The authors believe the condition to be the same as that described under the name of varioloid varicella by Anderson in Jamaica and Dickson and Lassalle at Trinity; and also that the epidemic which raged in Sydney in 1913 and caused so few deaths (1 per 1,000) was milk-pox and not small-pox. They are of the opinion that vaccination is effective protection against the disease, and consider its rarity in Brazzaville to be due to the fact that most of the inhabitants are inoculated annually against small-pox.

A Case of Red Grain Mycetoma (Madura Foot) (H. Griewank and M. Laveau, *Bull. de la Soc. de Path. Exotique*, October 8, 1919).—Microscopic examination of the red grains, after amputation of the foot, showed the case to be due to an arthrosporing hyphomycete which the authors classify in the family Oösporaceæ. Accepting Verdun's classification dividing the Oösporaceæ into three genera (Mycoderma, Nocardia and Sclerothrix), they consider their hyphomycete should belong to the genus Mycoderma, as having a septate mycelium exceeding 1 micron in calibre and free, rounded, budding, yeast-like elements.

Remarks on the Treatment of Phagedenic Ulcers (Louis Rousseau, *Bull. de la Soc. de Path. Exotique*, October 8, 1919).—Comparative tests with Dakin's solution, and salvarsan externally and intravenously, showed the latter to give the best results. After two or three injections of 0·30 grm. pain ceases, the general condition rapidly improves, and fusiform bacilli and spirochætes disappear.

Phagedenic Complications noted after Vaccination (M. Blanchard, *Bull. de la Soc. de Path. Exotique*, October 8, 1919).—Numerous cases of phagedenism having followed vaccination in different parts of the colony, and the vaccine used failing to show anything abnormal when tested, scrapings from the lesions were examined microscopically in the laboratories at Grand Bassam and found to contain an association of fusiform bacilli and spirochætes in a pure state. Though flies may be responsible for the dissemination of the infection, the author considers such an explanation doubtful in view of the facts that cases occurred in widely separated districts and that the complications appeared this year for the first time.

Note on a Case of Chronic Plague in a Rat without an Epizootic being Present (M. Laveau, *Bull. de la Soc. de Path. Exotique*, October 8, 1919).—Plague was introduced into Senegal some years ago and may now be considered to be endemic in that country. Recently there has been no epizootic among rats. The authorities have examined 354 rats and found infected only one, caught alive and showing no sign of acute plague.

A Fumigation Cabin for Native Infirmaries (L. Parrot, *Bull. de la Soc. de Path. Exotique*, October 8, 1919).—This is an exceedingly simple and inexpensive apparatus designed for native hospitals in the rural districts of Algeria. It consists of a brick cabin with a hearth let into the floor for a sulphur pot and a chimney in the roof which may be opened or closed from the outside. The clothes to be disinfected are introduced through a small door, hung on cords inside, and removed through another door. Both doors can be hermetically sealed with strips of gummed paper. The cost of each fumigation, including sulphur and gummed paper, should not exceed 50 centimes (about fivepence).

An Essay on the Climatology and Demography of Casablanca (L. d'Anfreville, *Bull. de la Soc. de Path. Exotique*, October 8, 1919).—The statistics given show a heavy though decreasing mortality. The climate is both hot and damp in the summer; there are violent winds part of the year and rainy seasons in spring and autumn. The active measures taken have practically suppressed small-pox except in newly arrived natives and Spaniards. Typhus (which is endemic in Morocco) and plague are being successfully dealt with, whilst malaria, which was formerly exceedingly prevalent, even among the natives, is gradually diminishing. Housing and drainage problems are being energetically handled by the authorities, and the town is rapidly becoming healthier as a place of residence for Europeans.

First Recorded Appearance of Pestis Bovina in Italian Somaliland (Paolo Croveri, *Bull. de la Soc. de Path. Exotique*, October 8, 1919).—The disease, hitherto unknown in Italian Somaliland, made its appearance with the first rains of 1917 among the mules at an outpost station on the confines of Abyssinia, having probably been imported from the latter country. Clinically, the form seen was œdematous and differed from the classical type described by Theiler in that it ran a much more rapid course and that the œdema did not always begin in the temporal fossæ; in some instances the abdomen was first affected. The speedy application of energetic measures effectively quelled the outbreak. A daily dose of 0·5 gr. of arsenious anhydride, continued for a month, would seem to be a useful prophylactic measure if it can be given to all the horses in the district.

Experiments in Vaccination against Pestis Bovina by the "Sero-Infection" Method of Schein (Paolo Croveri, *Bull. de la Soc. de Path. Exotique*, October 8, 1919).—The experiments undertaken failed to show that any real immunity against Pestis bovina was conferred on cows in Italian Somaliland by Schein's "sero-infection" method. The results obtained suggest that sero-vaccination is a more useful method of prophylaxis against the

disease, for if care be taken not to vaccinate calves before or immediately after weaning a positive reaction is obtained in 100 per cent. of cases, whereas the percentage of animals reacting to Schein's method is very low.

The German Medical Organization in the Cameroons (Gustave Martin, *Bull. de la Soc. de Path. Exotique*, October 8, 1919).—According to the Author, under German administration very thorough measures were in force for fighting the numerous endemic and epidemic diseases prevalent in the Cameroons. Large sums of money were spent and a large staff maintained. Besides hospitals, sanatoria and dispensaries, the system included medical stations in the interior of the country fully equipped with surgical, chemical, bacteriological, meteorological apparatus, &c., and stocks of quinine, mercury, arsenic and other drugs which were liberally dealt out to the population. Small-pox vaccine was obtained from cows kept in special parks and distributed regularly by travelling medical units. There were segregation camps for lepers and the study of sleeping sickness was methodically and assiduously carried on. The various departments worked hand in hand, and the senior military medical officer was ultimately responsible for all.

Reports of Societies.

MEDICAL SOCIETY OF LONDON.

Treatment of Malaria.

At a meeting of the Medical Society of London, held on November 24, Dr. V. Warren Low, C.B., President, in the chair, Lieut.-Colonel S. P. James opened a discussion on the Treatment of Malaria. After some interesting remarks on the increased number of indigenous cases of malaria in England, he expressed his ideas on the subject of treatment, calling attention to the very inadequate doses of quinine so often given by medical men with no tropical experience. Such procedure had caused in several cases disastrous results. At the invitation of the Ministry of Health he and Sir Ronald Ross had jointly drawn up a pamphlet in which a simple and inexpensive routine treatment had been described in detail.

Dr. G. Newton said that he recommended the administration of quinine by intravenous injection. The proceeding was simple, and thrombosis of the vein was of rare occurrence.

Dr. Aldo Castellani said that one word summarized the whole treatment of malaria—quinine. The drug should be given by the mouth in ordinary cases, by intramuscular injection in severe cases, and both intramuscularly and intravenously in pernicious cases. For oral administration he generally used the bisulphate, 30 to 45 gr. during the twenty-four hours. Quinine was the only specific, but occasionally arsenic, tartar emetic and phosphorus were useful, as they seemed to reinforce the action of quinine in certain cases.

Dr. Andrew Balfour said that the quinine treatment must be started as soon as possible during the acute stage of the malady. Oral administration suffices in ordinary cases, in severe cases intramuscular injections are successful, but they are chiefly useful for hospital practice. The practitioner should also remember that the patient should be treated and not the disease.

Dr. Gordon Ward said that he often gave small doses of opium in conjunction with the quinine treatment, as opium, being an antispasmodic, might tend to mitigate the severity of the rigors. He gave also, at times, small doses of aspirin; this drug being probably a vaso-dilator might hasten the sweating stage.

Major H. W. Acton recommended in relapsing cases due to the benign tertian parasite a cinchona febrifuge, which contains quinine, quinidine, cinchonine and cinchonidine.

Major J. Pratt Johnson said that in debilitated individuals quinine had very little effect on the parasites, and that more attention should be paid to the patient's own defensive mechanism. Salvarsan seemed to be successful in cases of benign tertian, but not in malignant tertian.

Dr. Manson-Bahr called attention to the abuse of intramuscular injections and the careless way in which they were not rarely performed, with the result that abscesses and even gangrenous processes developed.

Dr. W. H. Willcox said that the possibility of idiosyncrasy should always be borne in mind when giving large doses of quinine. He had seen almost complete amaurosis developing after the administration of 15 gr. of quinine.

Correspondence.

WHEN SHOULD A PATIENT, INVALIDED TO ENGLAND FOR MALARIA, BE CONSIDERED FIT TO RETURN TO THE TROPICS?

To the Editors of the Journal of Tropical Medicine and Hygiene.

Sir,—Sir James Cantlie, K.B.E., asks the above question in a leading article in the Journal of Tropical Medicine and Hygiene of 1st November and invites suggestions from his readers as to the best test that the patient is cured of his malaria and fit to return to the Tropics or not. The microscope, as he points out, does not provide a satisfactory test. Indeed the verdict of the microscope, as Masterman says, upsets all ordinary ideas of clinical experience. It sometimes reveals Laveran's bodies in swarms in the blood of persons, especially children, who exhibit no rise of body temperature and who are in perfect health, whilst in others suffering from clinical malarial fever it fails to reveal even one parasite after repeated microscopic search by experts. These two facts are sometimes quoted as

proof that Laveran's bodies are not the cause of malaria. They may also be quoted to show that the microscope does not provide a reliable test of whether a patient is cured of his malaria and fit to return to the Tropics or not.

With much diffidence I suggest that the specific gravity of the patient's blood supplies a more reliable test of whether he is cured of his malaria and fit to return to the Tropics or not. One advantage of it is that it enables an answer to be given to the question quickly. When the specific gravity of the patient's blood is equal to or, within physiological limits, higher than the average specific gravity of healthy blood he is cured of his malaria and fit to return to the Tropics. This of course does not mean that he is absolutely immune from again contracting the disease when he returns to a *climate* where it is prevalent. But it means that he is possessed of the same degree of immunity as the average healthy man proceeding to the Tropics for the first time. When the specific gravity of a man's blood is below the average of healthy blood he is not cured of his malaria nor fit to return to the Tropics until it has, by suitable treatment, been raised to the average specific gravity of healthy blood. It also supplies a reliable test whether, as regards malaria, those proceeding to the Tropics for the first time are fit to go there or not.

I will now try to explain why I make this suggestion. Long before instruments of research, such as the microscope, had reached their present state of perfection it was known that there is a retention of *water* in the blood and tissues of those who suffer from malaria. In the early paroxysms of primary cases it escapes observation, but as the paroxysms recur it becomes more evident and if the disease is prolonged it is considerable. Sir John Macculloch refers to it in his work on malaria published in 1827. Liebermeister said that in exceptional cases it is sufficient to explain an increase of body-weight by as much as 10 lb. (4 kilo.), although beyond the increase of body-weight there may be nothing to indicate it except a slight œdema of the eyelids or of the ankles. In many cases of malaria it is sufficient not only to mask any emaciation resulting from the febrile process but even to give rise to a deceptive appearance of obesity.

In a paper on malaria, in the French Supplement to the *Lancet* of 3rd May, 1919, M. Paisseau also refers to this retention of water in the blood and tissues in malaria and says that malarial cachexia corresponds with the condition described by Kelsch as *hydræmic* cachexia. In the exceptional circumstances in Macedonia it was found after primary attacks as well as after more prolonged attacks. It is evident then that there is a retention of water in the blood in malaria and this would lead us to expect that the specific gravity of malarial blood must be lower than the average specific gravity of healthy blood. Many, including Acton and Knowles, have shown that it is lower than that of healthy blood. Hence the suggestion that the specific gravity of a patient's blood provides a reliable test as to whether he is cured of his malaria and fit to return to the Tropics or not.

Whilst this retention of water in the blood and tissues in malaria has long been recognized no attention seems to have been directed to the way in which it is produced, or to the important share it takes in the explanation of the rigor, intermittent pyrexia, grave anæmia and enlargement of the spleen. It is obviously produced by the atmospheric conditions under which malaria becomes prevalent. Their chief characteristic is the very large proportion of water vapour which, for its temperature, the air contains.

Ordinarily, as atmospheric temperature rises excretion of water through the kidneys is reduced. This, of itself, would lead to a retention of water in the blood and tissues of those who breathe and are immersed in the atmosphere, but that, as the temperature rises, the capacity of the air for taking up water as vapour increases, producing a compensating increased evaporation of water from the skin and lungs which keeps the amount of water in the blood and tissues within physiological limits. Conversely, as atmospheric temperature falls, the capacity of the air for taking up water as vapour is reduced and this, by reducing evaporation from the skin and lungs would, of itself, lead to a retention of water in the blood and tissues, but that the fall of the atmospheric temperature produces at the same time a compensating increased excretion of water through the kidneys which keeps the amount of water in the blood and tissues within physiological limits.

Owing to the very large amount of water vapour in the atmosphere under which malaria becomes prevalent its drying power, for the temperature of the air, is very small. Hence evaporation of water from the skin and lungs of those immersed in such an atmosphere is much impeded during the daily rise of atmospheric temperature but more markedly during its nocturnal fall. The result is that the increased evaporation of water from the skin and lungs does not fully compensate for the reduced excretion of water through the kidney as the atmospheric temperature rises throughout the day. Neither does the increased excretion of water through the kidneys, caused by the nocturnal fall of atmospheric temperature, compensate for the reduced evaporation from skin and lungs produced by the low-drying power of the night air. Therefore water is retained in the blood and tissues, producing the hydræmia which is found in those who suffer from malaria.

The way in which the retention of water in the blood and tissues in malaria assists in the production of the characteristic rigor, intermittent pyrexia, grave anæmia and enlargement of the spleen, is not given in this paper, which is only an attempt to answer Sir James Cantlie's question.

MATHEW D. O'CONNELL, M.D.

Original Communications.

THE ETIOLOGY OF THRUSH.

By ALDO CASTELLANI, C.M.G., M.D., M.R.C.P.

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It is generally stated that thrush is due to the fungus *Oidium albicans* Robin. Since 1906, in a series of researches carried out in tropical countries and in the temperate zone, I have endeavoured to demonstrate that the etiology of thrush is far from being so simple, and that the condition is not caused by one fungus only, but by a number of different fungi, and that in reality the term thrush does not cover one affection only, but a group of clinically similar conditions due to different fungi.

Fungi Found in Thrush.—The fungi I have so far isolated from cases of thrush, in the Tropics and in temperate climates, may be classified as follows:—

Class: Fungi. Imperfecti—Subclass: Hyphales
- Order Thallosporales—Family Oösporaceæ Saccardo
  - Genus Monilia Persoon—Several species.
  - Genus Oidium Link—Three species.
- Order Hemisporales—Genus Hemispora Vuillemin—One species.

Class: Ascomycetes—Subclass: Protoascomycetes—Order Saccharomycetales
- Family Endomycetaceæ Rees—Genus Endomyces Rees—One species
- Family Saccharomycetaceæ Rees
  - Genus Saccharomyces Meyen—One species.
  - Genus Willia Hansen—One species.

I do not propose entering into any botanical details of these fungi as such details may be found in Castellani and Chalmers' "Manual of Tropical Medicine," Third Edition, p. 1079.

Fungi of Genus Monilia Persoon.—These are the fungi most commonly found in thrush. The botanical description of these fungi has been given in my previous papers as well as in the "Manual of Tropical Medicine" by Chalmers and myself. It suffices to say, from a practical point of view, that the fungi of the genus *Monilia* are characterized principally by the following features. In the lesions the vegetable body (thallus) is composed of mycelial threads of rather large size often showing arthrospores, and numerous free oval or roundish budding yeast-like forms—in cultures, especially on solid media, mostly roundish or oval budding elements are seen while mycelial filaments are very scarce or absent. These fungi, as a rule, ferment with production of gas, glucose, and often other sugars. The only Monilias I know of which do not attack any sugar or other carbohydrates are *Monilia zeylanica* Cast. and *M. zeylanoides* Cast.

There is little doubt that the original fungus *Oidium albicans* C. Robin 1853 belongs in reality to this genus, and its correct name is therefore *Monilia albicans* (C. Robin 1853). The term *Oidium* or *Monilia albicans* has been used in the past to cover a number of different fungi, as proved by the widely different descriptions of it given by different authors. For instance, some observers state that the organism liquefies gelatine, others deny that it possesses such action. Certain authorities describe it as coagulating milk, others as not having any action on this medium, &c.

The more important *Monilia* fungi I have found in thrush belong to the following types:—

Monilia balcanica Cast.—type. This group contains *M. balcanica* Cast., *M. parabalcanica* Cast.

M. krusei Cast.—type. This group contains:—*M. krusei* Cast., *M. parakrusei* Cast.

M. pinoyi Cast.—type. This group contains:—*M. pinoyi* Cast., *M. nabarroi* Cast.

M. metalondinensis Cast.—type. This group contains: *M. albicans* Robin *sensu stricto*, *M. metalondinensis* Cast., *M. alba* Cast., *M. pseudometalondinensis* Cast.

M. tropicalis Cast.—type. This group contains: *M. tropicalis* Cast., *M. metatropicalis* Cast., *M. paratropicalis* Cast., *M. pulmonalis* Cast., *M. nivea* Cast., *M. insolita* Cast., *M. enterica* Cast. Most of these species are, in reality, merely varieties of *M. tropicalis*.

M. guillermondi Cast.—type. (Rare.) This group contains: *M. guillermondi* Cast., *M. pseudoguillermondi* Cast.

M. chalmersi Cast.—type. (Rare.) This group contains:—*M. chalmersi* Cast., *M. parachalmersi* Cast., *M. macedoniensis* Cast. Only *M. parachalmersi* has so far been found in thrush.

M. pseudo-tropicalis.—type. (Very rare). This group contains: *M. pseudo-tropicalis* Cast., *M. pseudo-tropicaloides* Cast.

M. pseudo-londinensis.—type. This group contains: *M. pseudo-londinensis* Cast., *M. pseudolondinoides* Cast.

M. zeylanica Cast.—type. This group contains the following species: *M. zeylanica* Cast., *M. zeylanoides* Cast.

M. albicans Robin *sensu stricto* belongs to the metalondinensis type, and I have very seldom isolated it.

The various types can be easily differentiated by their action on the following carbohydrates: glucose, levulose, maltose, galactose, lactose, saccharose, inulin and dextrin.

Fungi of the 1st group (*M. balcanica* type) produce gas in glucose only.

Fungi of the 2nd group (*M. krusei* type) produce gas in glucose and levulose only.

Fungi of the 3rd group (*M. pinoyi* type) produce gas in glucose, levulose and maltose.

Fungi of the 4th group (*M. metalondinensis* and

albicans sensu stricto) produce gas in glucose, levulose, maltose and galactose.

Fungi of the 5th group (*M. tropicalis*) produce gas in glucose, levulose, maltose, galactose and saccharose.

Fungi of the 6th group (*M. guillermondi*) produce gas in glucose, levulose and saccharose.

Fungi of the 7th group (*M. guillermondi*) produce gas in glucose, levulose, galactose and inulin.

Fungi of the 8th group (*M. pseudo-tropicalis*) produce gas in *lactose* in addition to other carbohydrates.

Fungi of the 9th group (*M. pseudo-tropicalis*) produce gas in *dextrin* in addition to other sugars.

Fungi of the 10th group (*M. zeylanica* type) do not produce gas in any carbohydrate.

When a Monilia has been placed in one of the above groups, it is easy to make the specific classification by means of the annexed table.

Further details on the classification of the various species of the genus *Monilia* may be found in the "Manual of Tropical Medicine" (Castellani and Chalmers—3rd Edition, pp. 1070-1092). *It must be remembered that a certain number of fungi of the genus Monilia have not permanent sugar reactions and can be trained to ferment sugars which they do not ferment when recently isolated*, and therefore for purposes of classification and comparison such fungi should be investigated using only recently isolated strains.

Fungi of genus Oidium Link *emendavit* Pinoy.—This genus is morphologically closely allied to *Monilia*, but mycelial threads are very abundant both in the lesions and in cultures, and budding, yeast-like cells are rare. Fungi of this genus may occasionally induce an acid fermentation, but do not produce gas in any carbohydrate.

I have found fungi of this genus in certain cases of thrush in the Tropics and in the Balkans, but so far not in England. I have isolated three species: *Oidium matalense* Cast., *O. asteroides* Cast., and *O. rotundatum* Cast. It is interesting to note that I have found the same species in cases of mycotic tonsillitis, and in the expectoration of certain cases of bronchitis, while I have observed *O. rotundatum* and *O. asteroides* also in the stools of certain cases of enteritis. The description of these fungi may be found in previous papers by me, as well as in Castellani and Chalmers' "Manual," 3rd Edition, pp. 1093-1096.

Fungi of genus Hemispora Vuillemin.—These fungi are characterized by the presence of abundant mycelial hyphæ, some of which are conidiophores. Each conidiophore terminates into an ampulliform or sausage-like structure, which is called *protoconidium*. The protoconidium later divides into a number of spore-like segments which are called *deuteroconidia*.

So far only one species of this genus has been found in cases of thrush; *Hemispora rugosa* Cast. This fungus was first isolated by me from a case of mycotic tonsillitis in 1910, and observed in a case of thrush by Pijper in 1915. Two varieties can be distinguished: one liquefying gelatine, the other having no such action on the medium. Botanical details of this fungus have been given in various papers by me and by Pijper, and may be found also in Castellani and Chalmers' "Manual" (p. 1108 and p. 1743).

Fungi of the genus Willia Hansen.—These fungi are characterized by the peculiar bowler-hat shape of their ascospores. I isolated a fungus belonging to this genus in Macedonia from a case of thrush in a gypsy. In sugar broths it formed a thick pellicle containing air-bubbles. It produced gas in glucose and levulose only. Cultures on solid media contained asci with 2-4 spores of the peculiar hat-like appearance. The fungus seemed to be somewhat similar to *Willia anomala* Hansen, but the investigation of it is not yet complete.

Fungi of genus Endomyces Link.—These fungi are in superficial examination extremely similar to those of the genus *Monilia*, budding elements and mycelial threads being found in the lesions, and mostly budding elements in cultures. There is, however, a very important character which differentiates these fungi: In old cultures of *Endomyces* asci are present. Only once have I come across a case of thrush due to a true endomyces, in Macedonia in 1917. I considered it to be *E. vuillemini* Landrieu.

Fungi of genus Saccharomyces Meyen. In the Balkans I found a case of thrush due to a typical saccharomyces, which I have only recently studied. Fungi of this genus are characterized by the vegetative body consisting only of budding elements, and by the presence of asci in cultures. The saccharomyces isolated by me ferments with production of gas, glucose, levulose, galactose, maltose and saccharose. It does not clot milk, which, however, may occasionally become acid. Gelatine and serum are liquefied.

Clinical varieties of Thrush caused by above Fungi.—I have always endeavoured to study the cases of thrush I have observed both mycologically and clinically, to see whether different groups of fungi are causing different types of thrush. In my experience two principal varieties of thrush may be distinguished:—

(1) The white, or white-greyish type.—By far the most common. Characterized by the cream-white colour of the patches.

(2) The yellow, or yellow-brownish type.—Characterized by the yellowish, occasionally brownish colour of the patches.

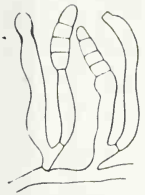
The first type may be caused by any species of the genus Monilia (except *M. zeylanica* Cast. and *M. zeylanoides* Cast.), by *Oidium matalense* Cast., by *Endomyces vuillemini* Landrieu, and by fungi of the genus *Saccharomyces* Meyen and *Willia* Hansen.

The second type is caused by *M. zeylanica* Cast., *M. zeylanoides* Cast., *Oidium rotundatum*, Cast., and *Hemispora rugosa* Cast.

Conclusion.—Thrush is not caused by one species of fungus only, the so-called thrush-fungus or

Monilia tropicalis Cast. (Preparation from a glucose-agar culture.)

Willia ascospores.



Hemispora protoconidia and *deuteroconidia.*

Oidium rotundatum, Cast. (from a culture).

Monilia tropicalis Cast. (from the lesions).

Oidium asteroides Cast. (from a glucose-agar culture).

To illustrate paper on "The Etiology of Thrush," by ALDO CASTELLANI, C.M.G., M.D., M.R.C.P.

Oidium asteroides Cast.
(Glucose-agar culture.)

Hemispora rugosa Cast.
(Glucose-agar culture.)

Monilia tropicalis Cast.
(Glucose-agar culture.)

Hemispora rugosa Cast.
(Glucose-agar culture.)

To illustrate paper on "The Etiology of Thrush," by ALDO CASTELLANI, C.M.G., M.D., M.R.C.P.

FUNGI OF GENUS MONILIA.

	Glucose	Levulose	Galactose	Maltose	Lactose	Saccharose	Inulin	Dextrin	Litmus Milk	Gelatine	Serum	Colour
Monilia alba Castellani 1911	AG	AG	AG	AG	O	A	O	O	AC	O	O	White
M. albicans Robin, 1853	AG	AGs	AG	AGs	O	Avs	O	O	AC	+	+s	,,
M. balcanica Cast. 1916	AG	As	O	O	O	O	O	O	O	O	O	,,
M. bethaliensis Pijper 1918	AG	—	O	AG	O	O	O	O	O	O	O	,,
M. blanchardi Cast. 1912	AGs	A	A	A	O	A	Avs	O	Avs / Alk	O	O	,,
M. bronchialis Cast. 1910	AG	AG	O	AG	O	AGs	O	A	O	O	O	,,
M. burgessi Cast. 1912	AGs	A	A	AGs	O	AGs	O	O	O / Alk	O	O	,,
M. chalmersi Cast. 1912	AG	AG	AGs	As	O	AG	AGs	O	As / Alk	O	O	,,
M. decolorans Cast. and Low, 1913 ...	AG	AG	A	AG	O	A	O	A	DC	O	O	,,
M. enterica Cast. 1911	AG	AG	AG	AG	O	AG	O	As	O / Alk	O	O	,,
M. fæcalis Cast. 1911	AG	AG	AGs	AG	O	AGs	O	O	A / DPs	O	O	,,
M. guillermondi Cast. 1910	AG	AG	A	AG	O	AG	O	O	O / Alk	O	O	,,
M. insolita Cast. 1911	AG	AG	AG	AG	O	AG	O	O	As / Alk	O	O	,,
M. intestinalis Cast. 1911	AG	AG	A	AG	O	A	O	O	ADs	O	O	,,
M. krusei Cast. 1909	AG	AG	O	O or As	O	O	O	O	O	O	O	,,
M. londinensis Cast. 1916...	AG	AG	A	A	A	A	O	O	AC	O	O	,,
M. lustigi Cast. 1912	A	AGs	A	Avs	O	AGs	O	A	As / D	O	O	,,
M. macedoniensis, Cast. 1917	AG	AG	AG	A or O	O	AG	AG	O	AC	O	O	,,
M. metalondinesis Cast. 1916	AG	AG	AG	AG	O	O	O	O	O	O	O	,,
M. metatropicalis Cast. 1916	AG	AG	AG	AG	O	AG	O	O	AC	O	O	,,
M. nabarroi Cast. 1917	AG	AG	O	AG	O	O	O	O	AC	O	O	,,
M. negrii Cast. 1911	AG	AG	AGs	As	O	AG	O	O	Avs / Alk	O	O	,,
M. nitida Cast. 1910	AG	AG	A	A	A	A	O	Avs	A / DC	O	O	,,
M. nivea Cast. 1910	AG	AG	AG	AG	O	AGs	O	O	O / Alk	O	O	,,
M. parabalcanica Cast. 1916	AG	As	O	O	O	O	O	O	AC	O	O	,,
M. parachalmersi Cast. 1917	AG	AG	AG	O	O	AG	AG	O	AC	+	O	,,
M. parakrusei Cast. 1912..	AG	AG	O	O	O	O	O	O	AC	O	O	,,
M. paratropicalis Cast. 1909	AG	AG	AG	AG	O	AG	O	Avs	As / Alk	O	O	,,
M. perryi Cast. 1912	A	AGs	A	A	O	AGs	Avs	O	As / D, Alk	O	O	,,
M. pinoyi Cast. 1910	AG	AG	O	AG	O	O	O	O	O	O	O	,,
M. pseudo-bronchialis Cast. 1916 ...	AG	AG	O	AG	O	AG	O	O	AC	O	O	,,
M. pseudo-guillermondi Cast. 1916 ...	AG	AG	O	O	O	AG	O	O	AC or P	O	O	,,
M. pseudo-londinensis Cast. 1916 ...	AG	AG	AG	AG	O	O	O	AG	O	O	O	,,
M. pseudo-londinoides Cast. 1916 ..	AG	AG	AG	AG	O	O	O	AG	AC	O	O	,,
M. pseudo-metalondinensis Cast. 1916 ...	AG	AG	AG	AG	O	O	AG	O	AC	O	O	,,
M. pseudo-tropicalis Cast. 1910 ...	AG	AG	AGs	O	AG	AG	O	O	ACs	O	O	,,
M. pseudo-tropicaloides Cast. 1919 ...	AG	AG	AG	O or A	AG	AG	O	O	O	O	O	,,
M. pulmonalis Cast. 1911... ..	AG	AG	AGs	AG	O	AG	O	O	O / Alk, D	O	O	,,
M. rhoi Cast. 1909...	AG	AG	AGs	Avs	O	AG	O	O	As / Alk	O	O	,,
M. rosea zenoni 1910	—	—	—	—	—	—	—	—	—	O	O	Pink
M. tropicalis Cast. 1909	AG	AG	AGs	AG	O	AGs	O	O	A	O	O	White
M. zeylanica Cast. 1910	A	A	A	A	As	A	Avs	A	ACs	O	O	Yellowish
M. zeylanoides Cast. 1917... ...	A	A	A	A	O or As	A	O or As	A	AO	O	O	,,

Abbreviations used in the Table:

A = acid. G = gas. C = clot (milk), clear (broth and peptone water); CTP = clear at first, then thin pellicle present. D = decolourized. P = peptonized (milk) pellicle (broth). Alk = alkaline. $\frac{A}{Alk}$ = acid, then alkaline. S = slight. vs = very slight. O = negative result—viz., neither acid nor clot in milk; neither acid nor gas in sugar media; non production of indol; non-liquefaction of gelatine or serum, as the case may be. + = positive result, liquefaction of medium.

Oidium albicans Robin, as generally stated. It is caused by a number of different fungi, some of which are botanically very far apart from each other, and belong to separate species, genera and families. The term Thrush covers in reality a group of clinically similar conditions, rather than one only; two principal types may be clinically distinguished, the white or grey-white type, extremely common, and the yellow or yellow-brownish type, of rarer occurrence.

A CASE OF APPENDICITIS IN A NATIVE OF THE SOLOMON ISLANDS, WESTERN PACIFIC.

By NATHANIEL CRICHLOW, M.B., Ch.B.Glasgow.
Government Medical Officer.

APPENDICITIS is a rare disease among the natives of the Solomon Islands, and during my five years' experience among these natives I have only come across one case.

The case in question was a young missionary girl, aged twenty-one years. She was "Christianized" and "Europeanized" and spent some time in civilization with her Missionary teacher, with whom she was evidently a favourite.

After being "Christianized" and "Europeanized" she left off eating native foodstuffs and used to eat European foodstuffs.

Her first attack of pain in the appendix region was felt about two months before admission, and this pain recurred at intervals of ten days.

She was first seen by the Mission Medical Officer, who advised that she be brought into hospital to be operated upon.

When I first saw the case, I had some doubts whether it was a case of appendicitis or not. The patient had a temperature, but on palpation in the appendix region there was little or no tenderness.

I decided to "wait and see." About a week later, the patient's temperature shot up to 103° F. and there was intense abdominal pain. On examination, tenderness was now present in the appendix region. On making a vaginal examination, I could not feel the appendix. The ovaries were apparently unaffected. I then made a rectal examination and felt the appendix as a hard finger-like protuberance. I decided thereupon to operate the following day.

On opening the abdomen, the intestines showed signs of peritonitis. I found the appendix acutely inflamed and bound down by many adhesions. It was about three and a half inches long, and there were three blocks of fæcal matter, one at the mouth, one at the tip and one in about the middle.

I removed the appendix, inserted a rubber drainage tube, and closed up the abdomen. The drainage tube was removed on the fourth day.

The after-operation treatment adopted was the rectal injection of saline solution three times daily for a week.

The patient made an uneventful recovery and was discharged apparently well and free from her former abdominal pains.

With regard to the above case, I cannot help feeling that the European foodstuffs and her life in civilization played some part in the development of her attack of appendicitis, as appendicitis is unknown here among natives living solely upon native foodstuffs.

Protein Therapy of Typhus (Prado Tagle, *Revista Médica de Chile*, August).—Intravenous injections of peptone were applied in fifty-nine cases of typhus. Aside from one patient that died in less than forty-eight hours, the mortality was about 5 per cent. The absence of by-effects confirms the harmlessness of the method for all ages. The acidity of the solution of peptone in physiologic serum was reduced to 4·3 per thousand, and the remedy was put up in 5 c.c. ampoules. About 10 c.c. was given as the first dose, to robust adults, otherwise from 4 or 5 c.c. for older children, up to 6 or 8 c.c., giving afterward only about half of the initial dose, and allowing an interval of forty-eight hours to elapse. In almost all the cases a second injection was given and, exceptionally, a third, with only 1 or 2 c.c. A subcutaneous injection of 2 or 3 c.c. of 20 or 25 per cent. camphorated oil was given every six hours day and night, with 0·25 c.c. per thousand epinephrin in each syringe. The patient must be kept in repose. The blood pressure falls during and immediately after the intravenous injection of peptone, but if it is made slowly (1 c.c. per minute) and if epinephrin has been given, the drop is slight. The coagulation time of the blood is much retarded. Analysis of the blood showed that the urea content could be disregarded with this protein therapy as the latter only slightly augmented it, and it soon dropped below its previous figure from the rapid reaction to the injection, while the dietetic restrictions in typhus aid in its being speedily cast off. Analysis of the urine likewise showed that the injections of peptone had no detrimental influence on the kidney and hence there were no contra-indications on the part of the kidneys, except of course with grave nephritis. There are no characteristic findings in the urine in typhus. Temperature charts show the attenuating and abbreviating influence of the protein therapy better than anything else. An interesting feature of the cases was that when the temperature had gone down under the injections, a further injection did not induce any appreciable reaction. The production of antitoxins can then be regarded as sufficient and the case as cured. In every case improvement in the general condition was unmistakeable.

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THE JOURNAL OF

Tropical Medicine and Hygiene

JANUARY 15, 1920.

UNIVERSAL NATIONAL ALLIANCE TO FIGHT PREVENTABLE DISEASES (TROPICAL).

EUROPE in the throes of post-bellum chaos, as evidenced by revolutions, political intrigues, piracies, strikes, foul murders, religious turmoil, promoted by so-called lovers and agents of freedom, has but little time for literary or scientific work, be it medical or other. Hunger reigns and all else is forgotten in the scramble for food. For five years the study of everything of the nature of science has been devoted to producing engines of destruction and to practising the art of medicine in alleviating the human ailments caused by them.

The science of medicine as regards research and the advance of sanitation has had to be dropped, for the laboratories have been emptied of their workers, and investigations set aside for the art of war. Nor is there likely to be, nor can there be, a speedy recovery from this calamity to scientific advancement. In few countries is the machinery available whereby regeneration can be for the moment accomplished. The foul-stained epidemic of Bolshevism has brought into being peoples who despise and would destroy absolutely all advancement in science.

In Britain and in the United States of America has it been alone possible to carry on even a semblance of investigation and practical work, apart from observations in the field; and now that the great fight is finished both countries are setting earnestly to work in the sphere of tropical medicine to "make good."

The subject chiefly to the fore is the application of knowledge, accumulated during the past twenty years, to the eradication of disease in tropical lands. The pursuit of the subject has assumed an economic interest far beyond anything heretofore in existence. Labour in tropical countries has recently assumed a new aspect. The coolie is of more value to-day than even five years ago. His wages have had to be increased in some cases to double and treble the pre-war scale. Food and fibre of all kinds coming from warm climates is produced at an enhanced price and therefore costs the consumer more. Uncontrolled disease due to deficient hygienic and sanitary measures will foster still higher wages; for the labour market of the world is not inexhaustible, as at one time it was thought to be. Disease lessens the labour available, it curtails the individual power of production, thereby requiring an extra number of labourers to reach a desired end in a given time, involving a greater, perhaps a ruinous, expense in the accomplishment.

The French found labour the crucial point in their attempt to finish the Panama Canal. Disease was so rife in the sphere of the canal that it exhausted the available labour supply of the world so that the work could not be finished. For the same reason in every military or exploratory mission in a tropical country that has been undertaken, the excess of labourers required, owing to the ravage of disease, has from time immemorial required a retinue of "camp followers" largely outnumbering the active elements of the force. As an example, it is well known that on the West African coast military expeditionary forces have always to engage three times the number of non-combatants actually required for work and baggage carrying, owing to the incapacity arising from infection by guinea-

worm alone. And, as in military, so in economic work the number of labourers employed have to be kept owing to disease at a higher level than would otherwise be required were preventable ailments eliminated, or even lessened, amongst the workmen's ranks.

Hitherto replenishing the labour supply has been comparatively easy; human life was cheap and labour cost little, but recently all has changed. In Europe the labour supply may be plentiful enough but it costs more. The hours have shortened from twelve to eight; the word has gone forth that "ca' cannie" is the rule of the hour, that is, that a man must work at a minimum rate and lessen production to the utmost. This calamitous combination generates a vicious circle which it will take some time to obviate and to bring home to all concerned that in this direction lies moral degradation and dishonest manhood. These so-called advanced European ideas are spreading to the peoples of other continents where disease to a degree unknown in Europe prevails, so that a third element is added to the questions of shorter hours and "ca' cannie" work during these hours, an added element which will remain until preventable diseases are really prevented. It is in this the third factor that medical science can assist in counteracting the poisonous teaching of to-day.

Let us have increased pay by all means; shortened hours of labour sufficient to allow of a man or woman working without exhaustion is a great national physical asset; but to compel a man to become dishonest by purposely diminishing his possible outcome to spite his employer is progressing along a road which is soul destroying. The consequence upon a race of men following such a regime will be a moral degradation, for the labourer is not worthy of more than his hire.

The prevention of disease in the Tropics is therefore a great economic factor to-day, with the European teaching penetrating other continents, increased pay, "ca' cannie" work plus the ravages of disease demanding as it does double or treble the number of men employed, presents a world-wide problem which must appal the most optimistic.

Granted therefore that the question is focused to the problem of the prevention of disease in tropical lands, how and by whom is that to be accomplished? As stated above, Europe, indeed the world, is in a state of mental chaos and economic turmoil. Few countries have the machinery, the men, or the money to tackle the all-important problem at present. The United States of America and Britain are the only two available countries and both are ready and willing to take up the white man's burden. During the war even scientific missions have been sent out from both countries to investigate, to report, and to deal scientifically with various questions of epidemiology, but only to a limited degree owing to the circumstances of war. Both are, however, now contemplating extended efforts in the prevention of disease. The United States are doing excellent practical work in the West Indies. They have well-nigh eradicated yellow fever from the shores and islands of the Gulf of Mexico and they are at present concentrating upon the eradication of ankylostomiasis or hookworm disease, the scourge of plantations in almost every tropical clime. This scourge in the West Indies is rife, no island or shore is free from it and the call for extra labourers due to this ailment alone is such that local impoverishment is engendered and the waste of capital is ruinous. Other preventable diseases there are, such as malaria, filariasis, yaws, leprosy, but let us take ankylostomiasis as an example to begin with. This intestinal infection by a worm, either the *Ancylostoma duodenale* Dubini or the *Necator americanus* Stiles, is widely met with throughout the Antilles. The ova of the worm as they leave the body with the fæces are usually deposited not in latrines but anywhere broadcast over the plantation, for coolies defecate in the squatting position in the open. In the moist soil the larvæ develop, and feeding on the vegetables or grasses attain maturity and gain access to the body by way of the skin or by way of the alimentary canal in the food. The evils they cause and how they cause them are well known and the economic loss, infection by them entails, is fully recognized by everyone who is cognizant with the matter at all. The pollution of the soil is the matter to be dealt with. This can be prevented in several ways, either by killing the worms by drugs—thymol, eucalyptus, chloroform, &c.—or by treating the soil by disinfectants, by burning, &c. In fact, the worm in one or other stage of its being can be readily dealt with and local immunity for a time can be obtained. But sanitary restrictions in a plantation or a farm here and there will not eradicate the ailment, for until all the soil of, say, a whole island is cleansed and further pollution prevented, local treatment by drugs or by incineration is mere waste of time. We have the same problem at home with rats; for destroying rats on one isolated farm is useless in attaining a permanent benefit; just as the cleansing of a single farm of thistles, dandelions, &c., is useless so long as the down from uncleansed neighbouring land is allowed to float over and deposit on the cleansed fields. Co-operation is necessary to bring about a permanent benefit in cases of this nature. But the machinery for co-operation is not to hand, otherwise it would have been put into force long ago. The purification of the soil of one parish, county, island or even nation is, if not futile, at least an imperfect and consequently an inefficient method of exterminating any ailment. The parish, county or national boundary applies only to human legislature; but neither bird nor beast, nor bacterium, and far less the air, knows any such limitation, and for scientific purposes such divisions are directly detrimental to rooting out disease. Even a natural boundary is useless; the island would seem to have a hopeful and ideal setting for the extermination of any given disease; but islands have neighbouring islands, and although the

distance may be too far for the mosquito and other insects to fly, and thereby naturally thwart the spread of certain ailments, birds can do so; ships carry insects and vermin, and passengers are landed from them that carry other things besides portmanteaux, in the form of blood parasites of many sorts.

There is but one method if we hope to attain the highest sanitation, namely, co-operation and international co-operation and again co-operation.

This scheme of international co-operation, it is satisfactory to know, is not without a foundation of hopefulness, for within the past few months a body of earnest men have formed themselves into a Tropical Disease Prevention Committee, having for its object the encouragement of International Medical Research and the Prevention of Disease in Tropical Countries. This is as it should be; the Committee has evidently grasped the broad principles that must obtain if permanent good is to be done. It is to be hoped that co-operation, complete and limitless, will attend the work of this body. Expeditions here and there to settle some obscure or unsettled bacteriological or epidemiological point have their purpose and do great scientific good; but the practical application of our knowledge to the eradication of a disease or group of diseases can be accomplished only by co-operation, international co-operation of the most intimate nature. An *entente* is not sufficient, but an alliance of heads and hearts, a brotherhood of effort fighting against a common enemy. The army by which this enemy, the most deadly with which mankind has ever waged war, must be organized. A general staff must be formed, headquarters established and divisions equipped; an army spirit and *moral* engendered and encouraged; all jealousies crushed and a real crusade of nations launched, having but a common object, namely, the ruthless extermination of preventable disease. All the people must be enlisted in this fight—"the laird, the tenant and the cotter"; no slackers nor conscientious objectors tolerated, for one defaulting nation may cause a hecatomb of deaths. We wish this newly formed Tropical Disease Prevention Committee well. It is an association of scientific and commercial men in Britain, pledged to accomplish a great work, free and untrammelled in its scope and earnest in its purpose. It is the first of its kind in the world and with a horizon which is boundless for good, scientifically and economically. A world alliance against disease; nothing else will suffice to defeat this universal enemy; so secretive in its methods, so foul in its purpose, so cruel to its victims, and uncompromising in the destruction it causes. A lead is being given by the British, and that the enemy can be defeated, crushed and exterminated, never to raise its head again, is as sure as that the "earth is the Lord's and the fulness thereof."

J. Cantlie.

Annotations.

Treatment of Sea-sickness (P. Cazamian, *Archives de Med. et Pharm. Nav.*, vol. cviii, pp. 241-284, 1919).—The author has found atropine very useful. In most cases all the symptoms disappear after one hypodermic injection of 1/50 to 1/30 gr. of the drug. In a late stage of the complaint, with great prostration and low blood-pressure, adrenalin may be associated with atropine.

Vaccinotherapy in Acute and Chronic Bacillary Dysentery (P. Nolf, *Journ. of the Amer. Med. Assoc.*, October 18, 1919).—The author, who during the war had to treat a large number of dysenteric patients (Flexner type), did not see any good result from serotherapy. He recommends vaccinotherapy, a method of treatment first used in India in chronic cases by Castellani and Greig in 1905.

Cutaneous Reaction and Desensitization in Quinine Idiosyncrasy (John J. O'Malley and De Wayne G. Richey, *Archives of Internal Medicine*, October, 1919, vol. xxiv, pp. 378-382).—The authors have studied two cases of idiosynerasy to quinine. They find that the skin test described by Baerner is a good index to hypersensitiveness. This method is carried out by making two superficial abrasions with a sterile needle on the flexor surface of the forearm, about three inches apart, after cleaning the parts with 95 per cent. ethyl alcohol. To one a solution of quinine bihydrochloride (1 in 20) is applied, while the other is left untouched, functioning as a control. In both individuals the scarification to which the quinine antigen had been applied showed a marked reaction, while the control scarification merely exhibited the results of traumatism. The reaction consisted in an itching burning sensation followed by an area of œdema on both sides of the needle scratch. The œdematous patch was surrounded by a bright red halo of erythema. Control tests carried out, using solutions of salicylic acid, caffeine citrate, potassium iodide, atropin sulphate and epinephrin did not produce any definite reaction. The authors made then an attempt to desensitize the patients to quinine, using Heran and Saint Girons' method which consists in giving daily a "desensitizing dose" of grm. 0·005 quinine with grm. 0·5 sodium bicarbonate, followed after one hour and thirty minutes by grm. 0·1 quinine bisulph. and 0·5 grm. of sodium bicarbonate the first day, and increasingly larger doses the following days.

In one of the cases the authors had very good results and succeeded in giving the patient 2 grm. daily without provoking any discomfort. In the other case the result was not so good. The authors observed that in the two cases the intensity of the cutaneous reaction was in inverse ratio to the degree of desensitization obtained.

Current Literature.

The Journal of Hygiene.

Vol. XVIII, No. 3.

Further Experiments in the Ætiology of Dengue Fever (J. B. Cleland, B. Bradley and W. MacDonald).—In this interesting paper the authors show that it is possible to transmit the disease to a healthy non-immune by the subcutaneous injection of blood derived from a dengue patient; that the virus may be passed through a Pasteur-Chamberland F. filter; that the virus is present in washed corpuscles, in citrated plasma, and serum free from corpuscles; that the virus is resistant to conditions outside the body for several days; that the incubation period is usually six to eight days, but may be as long as fifteen days; that immunity may be present to injection 229 days after a previous attack of dengue, that in one experiment made no evidence could be found that *Culex fatigans* is the transmitter of the virus; that no result followed inoculation of guinea-pigs and rabbits.

Observations on the Cultivation of Typhoid and Paratyphoid Bacilli from the Stools (T. W. McLeod).—The author has obtained good results by using Browning, Gilmour and McKie's brilliant green enrichment method.

On the Effects of Injection of Quinine into the Tissues of Man and Animals (Leonard S. Dudgeon). —Necrosis of the tissues always follows subcutaneous or intramuscular injections of quinine. The bad effects are not avoided by the addition of olive oil or fat, or by dissolving the drug in alcohol or ether. In an addendum Captain F. S. Hele states that quinine is not fixed in the tissues to any appreciable extent.

The Kitasato Archives of Experimental Medicine.

Vol. III, No. 2.

The Leucocytogregarine of the Wild Rat (Shigeru Kusama, Katsuya Kasai and Rokuzo Kobayashi). —The authors describe their parasite as having certain characters in common with *Leucocytozoon muris* Balfour, *Leucocytozoon ratti* Adie, and *Hepatozoon perniciosum* Miller. It undergoes sporogony in the rate-mite, *Lælaps echidninus*.

The Rat-bite Fever Spirochæte (Shigeru Kusama, Rokuzo Kobayashi and Katsuya Kasai).—The authors come to the conclusion that the human and the wild rat strains belong to the same species, and they believe that *Spirochæta morsus-muris* Futaki is very similar or identical with *Spirochæta minor* Carter (*Spirillum minor* Carter, *Spirochæta laverani* Breinl, *Spirochæta muris* Wenyon).

An Experimental Study on the Life-history of Sparganum mansoni Cobbold (T. Okumura).—According to the author's investigation *S. mansoni* is identical with the larval cestode found parasitic in the muscles of the frog (*Rana nigromaculata*) and the snake (*Elaphe climacophora*). *Cyclops leukartii* Sars is one of the first intermediate hosts. The final hosts are carnivorous animals, such as dogs and cats.

Bulletin de la Societe de Pathologie Exotique, November 12, 1919.

Notes on the Protozoal Intestinal Parasites of Man and Animals, by S. L. Brug.—This paper is divided into four parts. In the first the author deals with *Entamœba tenuis*, describes the characteristics by which it may be distinguished from *E. histolytica* and *E. coli*, and gives his opinion that in all probability it is unable to produce amœbic dysentery. The second part gives details of cysts in the excreta of rabbits which resemble those of the *E. coli* and to which the provisional name of *E. cuniculi* is assigned until the identity of the two shall have been proved. The third chapter is devoted to results obtained by the author in treating amœbic dysentery with emetine and salvarsan. The number of cases handled is small, but salvarsan gave so much more satisfactory results that he concludes the success of English writers with emetine must be due to the fact that the latter have only treated this form of dysentery to any considerable extent since the war, so that their patients were never old cases. The fourth part is a study of the intestinal amœbæ of the rat. Very numerous experiments showed that not only were exceedingly few rats naturally infected with *E. histolytica* but it was very difficult to infect them artificially; when infected they emitted an infinitely smaller number of cysts proportionately than human carriers. In the fifth chapter, on *Balantidium coli* in the Dutch East Indies, the author attributes the extreme rarity of infection with this parasite to the fact that the greater part of the population being Mahommedan no pork is eaten. The only case he has seen was that of a Mahommedan who had been employed by a European pork breeder.

Sleeping Sickness in North Katanga (Belgian Congo) from 1913 *to* 1918, by J. Schwetz.—Five years' work in charge of the Government measures for combating sleeping sickness in a very large district of the Belgian Congo showed that though palpalis is undoubtedly the principal transmitter of the disease and the other species of glossina more than probably share the responsibility to some extent, there are other factors in the ætiology which remain obscure. Like cholera and plague, sleeping sickness apparently passes through a periodic succession of epidemic and endemic, acute and chronic phases. The prophylactic measures adopted so far have been neither efficient nor thoroughly applied, and there is urgent need for further study of the disease, its etiology, epidemiology and prophylaxis.

On the Parasitic Flagellata harboured by some Insects and the Infections they may Produce in Mice, by A. Laveran and G. Franchini.—The flagellata studied were *H. ctenopsyllæ*, *H. cteno-*

cephali, *H. jaculum* and *Crithidia melophagi*. Intraperitoneal injections of *H. ctenocephali* or *C. melophagi* in pure culture were fatal to nine out of sixteen mice. The symptoms produced by the two organisms were similar and consisted in the appearance of free or endoglobular hæmatozoa of the Leishman type in the blood, rapidly multiplying in the more serious cases, quickly disappearing again in the milder ones; anæmia, often very pronounced, with accelerated respiration; declining appetite, loss of weight; and frequently final diarrhœa. The symptoms shown by mice receiving intraperitoneal injections of material from the liver and spleen of specimens infected from cultures afforded no indication that the virus had increased in virulence.

Latradectus mactans or "Lucacha" in Peru.—A *Clinical and Experimental Study of the Action of its Venom*, by Dr. Edmundo Escomel, Aréquipa (Peru).—The author has identified *L. mactans* at Aréquipa, where it was not hitherto known to exist. Experimental inoculation of the eggs into animals produced either neuro-myopathic arachnoidism or cutaneo-hæmolytic-gangrenous arachnoidism according to the dose. Injections into the peritoneum proved rapidly fatal. Repeated bites gave a certain amount of immunity but no definite result in this direction was arrived at by the inoculation of graduated quantities of the eggs, as the animals died as soon as the toxic dose was reached.

The venom contains a cerebro-neuro-muscular poison, a thrombokinase and a hæmolysin, and the eggs a proteolysin in addition. Clinical diagnosis is usually easy. Prognosis varies both as to the effect of the venom itself and that of secondary infections. Prompt treatment by potassium permanganate, internally and externally, is of certain effect, and explorers would do well to carry supplies of this substance with them when travelling in Peru.

Cupric Salvarsan and its Sodium Salt in the Treatment of Human Trypanosomiasis, by F. Van den Branden.—Intravenous injections of 0·005 and 0·0025 grm. per kilo body weight of cupric salvarsan in solution prepared according to Erlich's formula were of active effect and eliminated trypanosoma from the blood of infected blacks for long periods when the patients were in good general condition and the spinal fluid normal. Rapid relapse followed small doses of solutions of the sodium salt administered intravenously to adults and intramuscularly to children, but larger quantities gave better results. For prophylactic purposes cupric salvarsan seemed to be more useful than the sodium salt, as it is quicker and easier to prepare. Comparison of the average duration of blood sterility effected by *single doses* of the two substances in infected blacks with *normal spinal fluid* and *in good general condition* showed: (1) out of four cases each receiving 0·004 grm. of cupric salvarsan per kilo body weight two remained sterile for twenty-three and twenty-four months respectively and two were still sterile five years later; (2) out of four cases each receiving 0·0053 grm. of the sodium salt per kilo body weight two remained sterile for twelve months, and two after four and a half years.

Transmission of Piroplasmosis in French Dogs by Dermacentor reticulatus. Parasitic Emboli in the Capillaries of the Encephalon, by E. Brumpt.—From experimental evidence the author arrived at the following conclusions: (1) The piroplasmosis seen in French dogs is transmitted by the adult offspring of female *Dermacentor reticulatus* who have ingested virulent blood. The infection is therefore hereditary. (2) The adult progeny of infected female Dermacentor who have been harboured during the larval and pupal stages by refractory animals, such as the guinea-pig, may transmit the infection. (3) The larvæ and pupæ are apparently unable to transmit the infection even when the offspring of infected females. (4) The larvæ and pupæ, when fed with virulent blood, do not seem able to transmit the disease to the next stage. (5) The parasites propagate more particularly in the capillaries of the brain, and to a less extent in the kidneys and bone marrow.

A Contribution to the Study of Bovine Anaplasmosis, by Professor J. Lignières.—Experiments undertaken with a view to ascertaining the effect of inoculation of *Anaplasma argentium* into various animals showed that though guinea-pigs, rabbits, pigs and horses were uninfluenced by the organism, sheep and goats retain it alive in the blood stream for years and the passage from sheep to sheep and from goat to goat may go on indefinitely. The fact of inoculation proved that the parasite was present in the red blood corpuscles but, no doubt because of its extreme smallness, it could not be detected, and neither the sheep nor the goats showed any symptoms as a result except an occasional rise of temperature of 1° C. about the thirtieth day. The blood, however, was active when injected into animals of the bovine race subject to anaplasmosis.

The Leucocyte Count and Decrease of Eosinophils in Relapsing Fever, by H. Jouveau-Duhreuil.—Blood counts in ninety-one cases showed either decrease or increase of neutrophilic polynuclears, nearly always very marked increase of large mononuclears, considerable decrease or complete disappearance of eosinophils throughout the course, and reappearance of the latter to a larger extent than normal towards the end of the last feverish phase. Whenever the spirochæte cannot be recovered from the blood in a case of relapsing fever, diagnosis can be made on the evidence of a blood count; when the diagnosis is clear, a very small quantity of eosinophils or their entire absence is a sign that the disease is still running its course, and a number higher than the normal that the final phase has been reached.

Leprosy in the Cameroons, by Dr. Gustave Martin.—Leprosy is very common throughout the Cameroons, and assumes all forms. During tours

of inspection by the French between 1916 and 1918 practically every village produced at least one case. The ignorance of the people, the inertia of the chiefs, the opposition of the religious leaders and the large numbers of beggars and nomads in the country render isolation and prophylaxis difficult. Segregation villages are now being established for lepers, but the question of prophylaxis remains to be dealt with and the paper concludes with details of a scheme which includes the education of the black population in practical hygiene.

Three Cases of Oriental Sore, with Remarks Concerning the Method of Contamination, by L. Parrot.—The three cases comprised Dr. P., his wife and son, living at Mac-Mahon (Constantine), a locality in which oriental sore is unknown. In July, 1918, Dr. P. placed eight female *phlebotomi* of the species *pernicious* in a cage in his flat which already contained six *Tarantola mauritanica*. The former were captured at Mac-Mahon, the latter at El-Kantara, a recognized centre of leishmaniosis. A fortnight later Dr. P., on recovering from influenza, found that the *phlebotomi* had escaped from the cage. During November, 1918, the doctor and his wife were attacked by oriental sore, and on December 25 their son, who had been away at school since September 30, returned home showing the same condition. A native servant and a European family living in the neighbourhood showed no sign of the disease, and no other case was reported among the population in the locality.

The Granules of Spirochæta duttoni, by John L. Todd, M.D.).—The author points out that Dutton and he were the first to state that the spirochæte of African relapsing fever probably passed through some developmental process in *Ornithodoros moubata*. Many authors believe that a granular developmental stage occurs in the spirochætes. Others dispute the theory, but Todd, discussing the reasons advanced by the latter, considers they offer no proof that a granular stage of development does not exist. Much of the work done is open to the criticism of bringing indirect instead of direct evidence to the elucidation of the problem. All that is certainly known cannot controvert an assertion that spirochætes multiply only by direct fission; yet many observations make it probable that a development by a granular stage does exist, and it would be fitting if that method of development were known by Dutton's name. The paper concludes with a list of references.

The Weil-Felix Reaction in Exanthematic typhus. Low Agglutinating Power of Spinal Fluid, by J. Lapin and G. Senevet.—From tests made during an epidemic at Algiers in April and May, 1919, it would seem that the Weil-Felix reaction is of great value in the diagnosis of exanthematic typhus when positive. As, however, it is often only positive during the last few days of illness, no account should be taken of a negative reaction when the clinical symptoms point to typhus.

The agglutinating power of spinal fluid on proteus was observed in six cases. In four patients whose serum agglutinated at 1 in 500 the spinal fluid gave no agglutination at 1 in 50; in one patient whose serum agglutinated at 1 in 2,000 the spinal fluid agglutinated slightly at 1 in 50; in the sixth, whose serum agglutinated at 1 in 3,000, the spinal fluid agglutinated at 1 in 100. In the two latter cases the fluid was entirely free from blood derived from the puncture.

Plasmodium relictum, the Pathogenic Agent of Malaria in Birds, gives no Fatal Disease to the Mosquito which transmits it, by Etienne Sergent.—Plasmodium has hitherto been regarded as so pathogenic for the carrier insect that Ruge advised the selection of birds only mildly infected for the experimental infection of mosquitoes with blood containing the parasite. The author has observed several hundreds of cases of extensive *Plasmodium relictum* infection in Culex, and found that the mortality percentage was never higher among specimens showing at least 100 zygospores of maximum development than among the controls (those with only a few zygospores) or among fresh Culex (those which had not been fed with infected blood). He considers that *Plasmodium relictum* may attain its full stage of development in Culex without causing disturbances entailing the death of the insect.

In the Malaria of Birds (due to the Proteosoma) no Parallel exists between the Infection in the Blood of the Bird and the Infection of the Mosquito consequent upon Contamination by the Bird, by Etienne Sergent.—In the malaria of birds an incubation period of from three to ten days is followed by an acute stage, during which plasmodium is present in the blood in very large numbers for about a week. Mosquitoes fed with the blood at this period, when the parasites are of all ages and the gametes very numerous, become intensely infected; but if they are fed with the blood at a later stage, when the gametes are very rare, the number of zygospores obtained from the insect is not reduced proportionately. The blood of the bird continues to be very infectious for the insect during the fortnight which follows the acute stage, although the parasites in the blood of the bird have by that time become extremely rare.

An Autochthonous Malarial Centre in the Seine et Oise Department of France, by Dr. Roblin.—Three cases occurred, all due to the *Plasmodium vivax* and of a mild character. The first patient was bitten by mosquitoes, of which quantities were at the time present in that part of the Seine which runs through the district, and it is presumed that the insects were infected with malaria by a soldier returned from the East who had already been treated with quinine for slight attacks. The two other cases were infected by mosquitoes either from the first patient or from the soldier. The circumstance goes to show the necessity of carefully following up all men who return to the civil population with a history of malaria if outbreaks are to be prevented in districts where mosquitoes abound.

The Study of Tuberculous Infection among the Native Population of Ouargla Saharian by the Tuberculin Skin Reaction Test, by P. Bresson. —The population consists of coloured half-breeds (of Soudan negro and Arab blood), Arabs and nomadic whites, all living under conditions exceedingly favourable to the development of tuberculosis. The infection is imported as the result of temporary expatriation and consequent contact with Europeans. Both pulmonary and surgical tuberculosis are seen, the former running a particularly rapid course. The disease would seem to be transmitted rather from one member of a family to another than by any acquired heredity.

Some hundreds of tests were made, exclusively on the sedentary part of the population, and 545 results obtained. Of these the number of positive reactions was 199, or 36·5 per cent. In children under 1 year the percentage was *nil*, reaching the maximum in subjects of 15 and over. It was higher in the Arabs or Berbers than in the half-breeds (the latter being a hardy race and thoroughly acclimatized), and highest of all in the whites.

Abstracts.

HÆMOGLOBINURIC BILIOUS FEVER.[1]

By Charles Greene Cumston.

From the writings of the French physicians the pathogenesis of hæmoglobinuric bilious fever of tropical countries is now quite clear. As soon as a European settles in a tropical latitude he is directly exposed to a defensive struggle of the organism. All of the physiological resources, the renal, hepatic, splenic and digestive functions, are put to the hard labour of adaptation. It is on these physiologically overworked organisms that malaria imprints its tenacious and formidable marks. It upsets the circulatory system, causes morbid changes to take place in the glandular organs of organic defence and repair, produces disturbances in the digestive tract, compromising the physiological secretions. The effect on the nervous system is made manifest by neurotic disturbances, a special hyperexcitability, and at times by a temporary change of the psychic personality. This is a summary outline of the soil upon which hæmoglobinuric bilious fever develops.

Clinical observation shows that it is not one of these morbid processes which attack the European as soon as he enters the tropical zone, but that it almost always arises in persons who have made repeated visits to or have been some months in the Tropics and have contracted malaria. Blackwater fever is essentially a disease occurring in subjects who have been in the Tropics for years and have paid their tribute to malaria or to climate. Up to the present time no specific pathogenic agent of the disease in question has been discovered, so that if the malarial conception of the process is maintained, it would seem logical to attribute the characteristic accidents of the hæmoglobinuric syndrome to paludism.

When the human organism becomes infected with malaria the circulatory system is completely upset, since the hæmatozoon, which multiplies rapidly, lives at the expense of the red blood corpuscles. An immediate anæmia indicates an intense deglobulization, while the blood serum is laden with the detritus of the struggle, cadavers of the figured elements and those of the parasite as well, which, perhaps, constitute the origin of the toxin of the plasmodium. When the cell disintegration reaches one fifty-seventh of the total mass of the blood, the serum acquires the property of dissolving its own red blood corpuscles; it has become hæmolytic. Some writers attribute this serological change to demineralization of the serum. The blood serum becoming hypotonic, the red blood corpuscle absorbs water and gives off sodium chloride; following this, its hæmoglobin becomes free and is dissolved in the serum, giving it a red tint (slight hæmolysis). If hypotonia is very pronounced there is a complete melting of the corpuscle. This is total hæmolysis.

What we now know of antigens and antibodies gives us a more intimate conception of the mechanism of the emission of hæmoglobin in the urine. The action of an antigen of the body, in the circumstances the paludal toxin, produces an antibody in the circulating blood which may be hæmolytic for the red blood corpuscles of this body. This hæmolysin is composed of two elements, the one thermostabile, the sensibilisatrice; the other thermolabile, the alexin or complement. The sensibilisatrice is alone permanent in the specific serum; as to the complement, it is less stable and can be deviated by the complex: sensibilisatrice plus antigen.

When there has been considerable parasitic traumatism with a destruction of red blood corpuscles in the neighbourhood of one fifty-seventh part of the total mass of blood, the hæmolysis appears, so to speak, automatically in malarial subjects. On the contrary, in cases where the resistance of the red blood corpuscles does not reach such an excessively low degree, the complement will be deviated by the complex: malarial toxin plus sensibilisatrice. Hæmoglobinuria will not occur, but it is on the point of being produced. Then all that is necessary will be chilling of the body to at once cause an hæmolytic outburst, by the appearance of the necessary alexin.

Such seems to be the logical explanation of the pathogenesis of hæmoglobinuric bilious fever of tropical countries. But like any other morbid process its gravity will vary Rupture of the fragile organic equilibrium may only be temporary if a sufficient integrity of the organs of repair and elimination subsists. The spleen, whose efforts in

[1] Abstracted from *New York Medical Journal*, December 6, 1919.

the struggle can be clinically followed, intervenes by its hæmatopoietic functions. The hæmatopoiesis throws new elements into the circulation which will fill the place of those destroyed by the parasite. The liver likewise intervenes by the antitoxic functions it possesses; it can even eliminate the dissolved hæmoglobin when the amount is not too great.

When the outcome of the process is favourable the leucocytic formula follows a parallel evolution. The number of red blood corpuscles increases at the same time as their hæmoglobin content. A manifest hyperleucocytosis appears, characterized by numerous neutrophile polynuclears, and in these circumstances a mild, transitory hæmoglobinuria will represent the principal symptom. But if the attacks of the parasite have been more violent and have occurred in a subject weakened by the action of the climate, and if they have succeeded in producing profound changes of the viscera, the evolution will be different. An attack of icterus, with all its symptomatological train, occurs. It may appear suddenly or from the most vulgar causes, such as a chill, overwork, or even after a small dose of quinine. It is only too clear that in an intoxicated organism which no longer eliminates, a drug like quinine simply adds its toxic effects to those already present. It is probably to this fact that the genesis of exotic hæmoglobinuria has been attributed to quinine, but that is all it implies.

Hæmoglobinuria is not of necessity fatal and recoveries are frequent, but the first paroxysm must be looked upon as an important warning. In other instances the disease effects a very rapid progress. The patient lies limp upon the bed, marked icterus is present with dark, scanty urine; anuria may arise. Hiccough is persistent and the vomiting incoercible, the vomitus itself being sometimes hæmatic, and the patient dies with all the manifestations of uræmic intoxication. Such is the pathogenesis of hæmoglobinuric bilious paroxysm of malarial origin, but all the cases cannot be explained in the same way. Hæmoglobinæmia can be realized only with some difficulty since it is only when red blood corpuscle destruction has attained one fifty-seventh of the total mass of blood that the serum acquires the property of hæmolysing its own cells.

In these circumstances it was logical to suppose that other foci which could give rise to the hæmolytic phenomenon existed in the organism. In the spleen of malarial subjects hæmolytic, and even autolytic substances are present, which, in the physiological state, cannot be placed in evidence by the technical means employed at present. The spleen is capable of hæmolysing a certain number of red blood corpuscles contained in its parenchyma, although to a very limited degree, and in the normal state it remains within the bounds of physiological hæmolysis. In a more advanced degree it increases its hæmolytic power by the addition of cell fragility and hæmolysinæmia.

The liver acting on blood coagulability and on the red blood corpuscles causes true hæmolytic icterus. The malarial parasite may provoke hepatic lesions which cause the bile to enter the circulation and there it dissolves the hæmoglobin by the cholates it contains.

But of all the organs which should be especially incriminated, the kidney stands foremost. The frequency of renal lesions found at autopsy in these cases is notorious and their hæmorrhagic nature has been demonstrated beyond a doubt by a number of observers. The renal lesions explain why only red blood corpuscles and no trace of dissolved hæmoglobin are found in some cases of bilious fever. The malarial parasite produces a true nephritis, and it is to these cases that the old term of hæmaturic bilious fever should be retained in our modern nomenclature. The kidney should no longer be regarded as a simple emunctory; it plays a part in the genesis of hæmoglobinuria by itself freeing the hæmoglobin. Thus can be explained slight paroxysms of hæmoglobinuria without much pyrexia.

To sum up the pathogenesis of the process under consideration, it may be said that there are several ways of forming the hæmoglobinuric syndrome, viz., hæmolysis in the circulating blood, renal hæmolysis (frequent), hepatic and splenic hæmolysis. In some serious cases the entire organism is involved in the hæmolysis, and in the clinical evolution of the morbid process, in its geographical distribution and in its pathological manifestations, is encountered the visible, yet mysterious action of malaria, of its specific agent or its toxins.

The best prophylaxis against the affection is quinine, as this drug prevents the development of malaria. Therefore it does away with the soil in which the process develops. The treatment of the attacks of hæmoglobinuria is not simple. The exhibition of quinine should be reserved for the mild cases, with high temperature (of the malarial type) without any serious damage to the general health and especially when there is sufficient renal permeability. When the hæmoglobinuria is intense and the parasite is found in the blood, when urine is scanty or even anuria exists, all leading to uræmia, quinine is both useless and dangerous. The same applies to all other drugs. The treatment should be directed to increasing the blood pressure and to remove all obstruction to renal elimination.

To fulfil this end diuretic drinks must be given freely. In Africa there are two decoctions which have a more or less merited reputation, namely, *Cassia occidentalis*, which is employed at the dose of 1 ounce of the plant to a quart of water, and secondly, a plant of the Combretum genus, called *kinkélibah*, in a 10 per cent. decoction. If these plants are not at hand, very dilute coffee or tea can be used. The essential is that the diuretic drink employed shall not contain any active toxic principle.

Subcutaneous injections of salt solution may be given unless there are advanced renal lesions, especially if there is œdema or anasarca. The renal congestion can be relieved by dry cupping over the lumbar region. Cold rectal injections should be given and the vomiting and epigastric pain can be relieved by chloroform water.

SURGICAL PROBLEMS AND DIFFICULTIES IN THE TROPICS.[1]

By D. J. Harries.

The belief that chloroform is the only anæsthetic that can be administered on an open mask in India was put to the test at Deolali, and it was found that ether given by the open method acted almost as well as it does in England; but possibly a little more had to be administered, especially if a preliminary dose of morphia, ¼ gr., and atropine, 100th gr., had not been administered half an hour before the anæsthetic was commenced. The temperature in the shade at Deolali during the hot weather goes up to 104-106° F. It is quite probable that at temperatures of 110-116° F. the administration of open ether might present insuperable difficulties, but this should not be made an excuse for the complete abolition of ether from the operating theatre during the cold season.

When operating the temperature is important. The surgeon has to decide whether the discomfort caused by the wearing of a head-gear and face mask is more than compensated for by the increased protection afforded to the patient. By wearing these articles the amount of perspiration lost by the operator is certainly increased; but, on the other hand, there is less danger of any dropping into the operation area. The latter advantage outweighs the disadvantages, and I now invariably use both a headgear and a face mask when operating. It is often stated that, even if a few drops of perspiration did accidentally fall into the wound, very little effect would be produced on the way it heals; but this statement ought not to be accepted as a fact, and it would certainly not be readily accepted if the operator happened to have a number of boils or pimples on his face.

The technique of the actual operation has to be modified to meet the abnormal way the tissues react to trauma. This brings in the question of oozing into wounds, incisions, &c. Far more bleeding points have to be tied in any ordinary operation performed in the Tropics than in the same operation carried out in England. Moreover the tendency for oozing to take place after the operation, and even after the removal of the stitches, has to be taken into account in applying the dressings and bandages. Collodion dressings should never be employed after any operation, or even after the removal of the stitches.

Oozing is more pronounced during the monsoon season, and like many other unexplained physiological phenomena in India, is put down to the patient's " thin blood."

This subject has an important bearing on operations on joints; more especially the removal of loose cartilages or bodies from the knee-joint. If a tourniquet is used the actual operation presents no more difficulties than when carried out in England. It is unnecessary to add that all vessels external to the synovial membrane should be tied; and before a tourniquet is removed the knee should be firmly bandaged over a thick layer of wool, extending about 3 to 4 in. beyond the limits of the joint capsule. This dressing is left on until the stitches are removed on the seventh or eighth day. When the above instructions have been carried out the results show no appreciable differences from the results obtained in England.

Individuals who have contracted malaria make bad subjects for operative treatment. In the first place, the anæmia following an attack of malaria aggravates the oozing into the wound; and this is a matter of importance when operating on organs where it is impossible either to tie all bleeding points or to apply the requisite degree of pressure after the operation, e.g., operations on the liver or intestines.

In the second place, it is soon realized by the surgeon that an operation, even a minor one, will almost certainly precipitate an attack of malaria. Sometimes the patient has never had a previous attack, and never knew he had been infected; or he may have gone for several years without an attack, and thought he had completely got rid of his malaria. The most important factors concerned in precipitating the attack are still matters of personal opinion. There are obviously three possibilities. The attack may be precipitated by:—

(1) The mental worry.
(2) The actual trauma.
(3) The action of the anæsthetic.

Regarding the first, attacks are precipitated in patients who have been told that they were to be operated on next day, but for some reason or other they were not operated on.

The influence of trauma is well known to all surgeons, as any injury, such as the fracture of a bone, in a malarial subject is often followed by a recrudescence of the disease.

It is obviously impossible to estimate the effect of the anæsthetic in stimulating the activity of the parasite. Cases are known where a malarial attack has followed an examination under an anæsthetic; but here, of course, one cannot eliminate the influence of the accompanying mental disturbance.

It is quite obvious that all these factors interfere with some mechanism which keeps the parasite under control. It is well known that the incidence of almost any disease, including a " chill," may precipitate a malarial attack. Many theories could be advanced to explain this problem, but it would be more to the point to try to find some explanation applicable to all cases. It seems reasonable to suggest that the circulatory changes, induced by all these different disturbing agents, may be the most potent factor causing the liberation and multiplication of the parasites. Collapse, however produced, rapidly causes the suprarenals to discharge their chromaffin bodies in the attempt to supply the pressor substances necessary for the maintenance of a good circulation. A diminution in the supply of these pressor bodies allows changes in the circulation which possibly favour the activity of the malaria parasites. The popular expression " that

[1] Abstracted from the *Indian Medical Gazette*, December, 1919.

the patient is run down" means much the same thing, and so does the expression "diminished vitality."

It has been suggested that trauma liberates some ferment which stimulates the malaria parasites.

It might also be suggested that the lipoids, which may help to keep the parasites under control, are dissolved by the anæsthetic; but these two suggestions would not be applicable to attacks following on mental worry or shock in the absence of an anæsthetic.

Apart from theoretical considerations, it is a fact "that a temperature of 102-104° F. coming on a few days after a carefully conducted laparotomy or arthrotomy in a malarial subject is more likely to be due to the malaria parasite than to sepsis." Operators should carefully ask each patient before operating if he is a malarial subject, and if so, put him on quinine for three or four days before the operation and continue giving it for about ten days. By doing this he will obviate all rises of temperature due to the malaria parasite.

There is another condition due to the malaria parasite which is of considerable importance to the operating surgeon, viz., the condition termed "abdominal malaria." During an attack the patient has a rise of temperature, and symptoms and signs suggestive of acute peritonitis, and it is mistaken for cholera; but the finding of the parasite in the blood and the absence of the vibrio from the excreta establish the correct diagnosis. An abdomen was opened for what was considered to be acute peritonitis, secondary to appendicitis; the condition found was unlike anything seen before. The intestines were slightly injected and appeared to have been painted over with a thin layer of milk. Here and there were very small collections of the same sort of fluid lying between coils of intestines. The removed appendix was found practically normal. The appearance of the temperature chart next day, together with a history of a previous attack of malaria, suggested the correct diagnosis and the parasites were found in the blood.

On opening an abdomen for what was considered to be a perforation of some part of the intestine, the condition found inside the abdomen was exactly the same as found in the supposed appendicitis case mentioned above, and the subsequent discovery of the parasite in the blood rendered the diagnosis clear.

An acute dysenteric abscess of the liver presenting in the epigastric region simulates to some extent a perforation of the intestine. This type of hepatic abscess develops very rapidly and within twenty-four to forty-eight hours of the appearance of symptoms a large swelling is formed in the epigastric region. A localized collection from a gastric ulcer which has slowly perforated presents very much the same symptoms and physical signs, and the exact diagnosis is often impossible to establish before a laparotomy has been carried out. An X-ray examination before operation might demonstrate the collection to be entirely within the limits of the liver shadow, and so strengthen the evidence in favour of a liver abscess; but one must remember that the same appearance would be presented by a collection lying under the liver, but covered over by an overlapping anterior liver margin. Putting in an exploring needle is not justifiable in such cases unless followed by an immediate laparatomy.

As a laparotomy is the correct treatment for either condition, there is no advantage in first exploring with a needle. Another peculiarity of these epigastric liver abscesses and one which is rather disconcerting when present, is the fact that they may show pulsation, which at times appears to be expansile. One was operated on the size of a tangerine orange in the anterior margin of the liver in a man 42 years of age. It was adherent to the anterior abdominal wall and felt like an aneurism of the abdominal aorta. The temperature chart reaching 103° F. and the absence of all murmurs decided the diagnosis and this was confirmed at the operation.

There is one other subject of practical importance, viz., the subject of mechanical appliances. When recommending these in preference to an operation the surgeon must take into consideration the discomfort caused by any appliance in a tropical country. A truss or belt for a rupture may be easily tolerated in a cool climate; but in a hot climate the skin soon shows signs of irritation at all points of pressure, and marching becomes an impossibility. Apart from the diminished efficiency of the man with a truss the above consideration should influence the surgeon to advise an operation in every case, unless contra-indicated by some systemic disease.

DEER FLY FEVER, OR PAHVANT VALLEY PLAGUE

In recent years there has occurred among the rural population of Millard County, Utah, a disease initiated (according to popular belief) by a fly bite on some exposed surface of the body and manifested by the enlargement of the lymph glands which drain the bitten area and by a fever of a septic type lasting from three to six weeks. The site of the bite and the affected lymph glands become tender and inflamed, and they commonly suppurate. There is marked prostration and the patient is confined to his bed. The first case known to have terminated fatally was reported in 1919. The Surgeon-General of the U.S.P.H. Service detailed Dr. Edward Francis to investigate this new disease. Cultures made on ordinary laboratory mediums from the lesions of animals dying from the disease were negative; but cultures made on coagulated egg yolk yielded a growth of a small non-motile coccobacillus. These cultures reproduced the lesions of the disease in guinea-pigs. It is believed that this organism is the *Bacterium tularense*, first described by McCoy and Chapin in 1912.

The authorities of the Liverpool School of Tropical Medicine have conferred the Mary Kingsley Medal for 1919 on Dr. F. W. Scott Macfie, in recognition of his distinguished scientific work in West Africa.

Original Communications.

THE "*TENUE*" PHASE OF *PLASMODIUM VIVAX* (GRASSI AND FELETTI 1890).

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and
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Contents.—*Introductory — Historical — Clinical Notes — The Malarial Parasite — The "Tenue" Phase — Summary — Acknowledgments — References — Illustrations.*

Introductory.—Quite recently by the kindness of Captain McKail, Senior Medical Officer, British Troops, Khartoum, we obtained a blood slide from a British soldier suffering from tertian malaria.

This slide was taken during the febrile attack, i.e., about 10 a.m. on the morning of the 13th October (*vide* temperature chart) and before the patient had received any quinine. It showed in some of the erythrocytes such peculiar forms that we think it is useful to record our observations thereon and to compare them with such similar conditions as have been described by others. Our intent is to establish the possibility of the existence of an occasional phase in the life cycle of all the human malarial parasites which so far has not received sufficient attention and when met with is apt to confuse the observer.

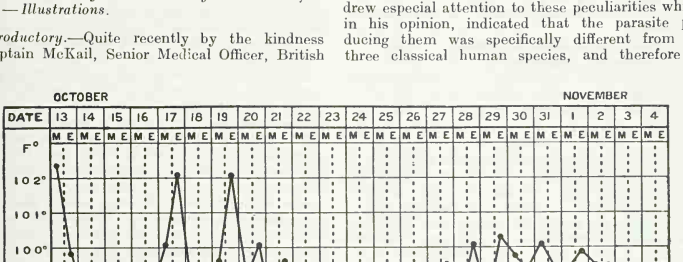
Historical.—Soon after Golgi had traced the life history in man of the malarial parasites, various methods of coloration were brought into play with the view of demonstrating their structure, and peculiar forms were noted by Mannaberg, Bignami and others.

In due course more especial attention was paid to these peculiar forms, as seen in the quartan parasite, by Billet in 1906 and by Ziemann also in the same year. They both stated that they had noted the same peculiarities in the subtertian parasite and gave illustrations.

In 1908 Balfour produced an excellent coloured plate in the third report of these laboratories which well illustrates some phases of these forms as seen in the subtertian parasite.

In 1913 Ed. and Et. Sergent, with Béguet and Pantier, gave illustrations of the same phase in the subtertian parasite.

In 1914 Stephens, in the Royal Society and in the *Annals of Tropical Medicine and Parasitology*, drew especial attention to these peculiarities which, in his opinion, indicated that the parasite producing them was specifically different from the three classical human species, and therefore he proposed the new name *Plasmodium tenue* Stephens 1913.



Later in the same year Balfour and Wenyon discussed the specificity of the new parasite, and, drawing especial attention to the forms already illustrated by Balfour, and adding two further cases of subtertian malaria, in the blood of which a similar phase could be found, came to the conclusion that *P. tenue* was not specifically different from the subtertian parasite. So far as we know these peculiarities have not yet been found in the tertian parasite (*P. vivax*), and therefore we attempt to remedy this gap and at the same time to discuss the nature of these peculiar forms.

Clinical Notes.—These are divisible into three parts, viz.: The Malarial Attack, the Dermatitis Scarlatiniformis and the Furunculosis.

(*A*) *The Malarial Attack.*—A British soldier, aged 22 years, felt out of sorts about noon on

October 9, 1919. He had previously had sand-fly fever while in Palestine, but never malaria, and never, to his knowledge, had he taken a dose of quinine in his life, nor had specimens of his blood taken for examination.

He did not feel ill enough to report sick and felt quite well next day, with the exception of slight headache about noon. On October 11, he again felt ill and shivered considerably, but did not report sick, and on the 12th felt perfectly well.

On the 13th he again felt ill and again shivered, so he went to the hospital, where his temperature was noted to be 102·4° F. and his spleen to be enlarged and tender. A blood film was taken at once, about 10 a.m., while the temperature was still rising and before any quinine had been administered.

His differential leucocyte count on this day was as follows:—

Polymorphonuclear leucocytes ...	84
Eosinophile leucocytes	3
Mononuclear leucocytes ...	5
Large lymphocytes	4
Small lymphocytes	4
Total	100

As the malarial parasites depicted in Plates I and II were found, the patient was treated by quinine hydrochloride administered orally in solution.

On October 13, 14 and 15, 45 gr. were given per diem, supplemented on the 14th and 15th by 9 minims of liquor arsenicalis per diem.

On the 15th, 17th and 18th this dosage was reduced to 30 gr. of quinine daily, supplemented by the same quantity of arsenic as before.

On the 19th, as he had developed the rash presently to be mentioned, he received only the early morning dose of 10 gr. of quinine and 3 minims of arsenic.

On the 17th and 19th his temperature rose to 102° F., but malarial parasites were absent from the peripheral blood. Although in some way associated with the dermatitis, which was in full eruption, the elevations of temperature showed tertian periodicity of a deferred type.

After this the temperature fell by lysis, reaching normal on the 24th and 25th, when the malarial attack may be taken to have ended as no parasites were again found in his blood, and his spleen diminished in size gradually and did not again become tender.

(*B*) *The Dermatitis Scarlatiniformis.*—To the best of his knowledge, prior to October 13, 1919, the patient had never taken a dose of quinine in his life.

On that day he began a course of quinine therapy in order to combat his attack of tertian malaria, and, as already stated, he took 45 gr. of quinine hydrochoride orally. The drug was administered in solution, and was repeated next day, being supplemented by arsenic.

On October 15 there was some redness of the skin, but the same doses of quinine and of arsenic were administered.

On the 16th, after the patient had taken 135 gr. of quinine hydrochloride, a profuse erythematous eruption appeared. The quinine and arsenic were continued, though the dosage of the former was now reduced to 30 gr. per diem.

On the 17th this rash was more developed and the patient's temperature rose to 102° F., but dropped to normal on the 18th, though the eruption was worse and the lips and eyelids swollen.

On the morning of the 19th the patient only received the morning dose of 10 gr. of quinine and 3 minims of liquor arsenicalis because a diagnosis of dermatitis scarlatiniformis due to quinine (*vide* Chalmers and Innes in the references) was made. It is interesting to note that at the commencement of this day the patient complained of sore throat, and on inspection the fauces were noted to be red and congested. The temperature on this day again rose to 102° F.

With the cessation of the quinine therapy the temperature gradually fell by lysis, reaching normal on the 24th and 25th.

The throat symptoms quickly disappeared, while the erythema grew paler, but an extensive desquamation (fig. 21) set in, which lasted till early in November, though much reduced in amount after a week.

The dermatitis affected almost every part of his body from the crown of his head to the dorsa of his feet, but it appeared later, and was less marked on the legs than elsewhere. During the eruption he complained of some slight cutaneous irritation.

While the dermatitis was subsiding quinine was being passed in the urine, as is evidenced by a trace being detected on October 26 by Dr. Joseph, the Government chemist of these laboratories, using Ramsden and Lipkin's modification of the Tanret reaction.

This is interesting, as none had been administered since the morning of the 19th, i.e., for no less than seven days, and therefore this would indicate a possible locking up of the drug in the system.

In regard to this *Dermatitis scarlatiniformis*, it appears to us to agree with the case reported by Chalmers and Innes in this journal in 1917, to which reference may be made for diagnostic and other considerations.

As to its causation, it appears to be of the nature of an anaphylactic phenomenon (*vide* Chalmers and Martyn and Chalmers and Innes in references).

The condition was treated by salol and calcium lactate administered orally, and by calamine lotion externally.

(*C*) *The Furunculosis.*—While the Dermatitis *scarlatiniformis* was subsiding the patient suffered from a severe attack of furunculosis which caused the rise of temperature from October 27 to November 3 inclusive, as can be noted by a study of the temperature chart.

Boils are not uncommon after any condition

which lowers the resistance of the body to the causal germ *Aurococcus mollis* Dyar. His differential leucocyte count at this time was:—

Polymorphonuclear leucocytes ...	63
Eosinophile leucocytes	15
Mononuclear leucocytes ...	8
Large lymphocytes	8
Small lymphocytes	6
Total	100

The furunculosis is as yet not cured, but this completes the clinical account of the case, as far as we are concerned, and we will now turn to the main subject of this communication, viz., the malarial parasite.

The Malarial Parasite.—An examination of the patient's blood prior to the first dose revealed an infection with two generations of *P. vivax* (Grassi and Feletti 1890). The younger generation is demonstrated in the coloured plate, i.e., Plate I in figs. 1, 2 and 3, while the older generation is set forth in figs. 6, 10, 11, 12 and 19. It is unnecessary for us to make any remarks on these forms, some of which are indicated in the photomicrographs of Plate II, figs. 22, 23, 24 and 25.

The "Tenue" Phase.—Fig. 3 of the same coloured plate depicts a trophozoite, which appears to us to be smaller than an ordinary ring form of the simple tertian parasite, while figs. 5, 8 and 9 depict peculiar types. All these may or may not be early stages of the "tenue" phase.

Fig. 7, however, without doubt indicates an early "tenue" phase. Here two rings are shown joined together by a narrow loop of cytoplasm, but only one ring is provided with chromatin.

A further step with two rings, well provided with chromatin is demonstrated in fig. 13, and the snapping through of the connecting protoplasmic bridge would produce such forms as fig. 4 or fig. 17. It would appear that the big loop in fig. 13 might be the origin for more rings, as set forth in fig. 15, where in place of the one large and one small ring of fig. 13 there are two medium-sized rings, and one small ring which has evidently become reduced by giving rise to an achromatic loop. The separation of four such rings is demonstrated in fig. 18, while fig. 14 demonstrates a further development in which four chromatin bearing rings are visible, one of which is giving rise to an achromatic loop while one solid pseudopodial-like form contains chromatin and reminds one of a possible earlier stage of fig. 9.

Figure 16 is the furthest development of the "tenue" phase which we have illustrated, but we have seen one containing no less than seven such rings.

The photomicrographs depicted in Plate II, figs. 26, 27 and 28, substantiate the coloured illustrations.

Comparison.—If these figures are compared with Balfour's Plate VII. in the Third Report of these laboratories, with Stephens' Plate of *Plasmodium tenue* in the *Proceedings of the Royal Society*, and more especially with Plate II. of Balfour and Wenyon's paper in the JOURNAL OF TROPICAL MEDICINE AND HYGIENE, a general likeness to many forms will be easily recognized, if it is remembered that the species of parasite is different.

Unfortunately we are unable to compare our illustrations with those made for the Quartan parasite, but judging by written statements they resemble the forms seen in the subtertian parasite and, if this is so, must in some way resemble our forms.

Theorctical Considerations.—The usual method of a sexual reproduction in the telosporidia is by the formation of merozoites. The human malarial parasites which belong to this protozoal class form no exception to this rule, as may be judged by an examination of Plate I, figs. 11, 12 and 19 and Plate II, figs. 24 and 25.

Simple and multiple fission are however common in the flagellata and simple fission is noted in the piroplasmidæ.

We are of the opinion that the correct explanation of such forms as those depicted in Plate I., figs. 7, 13, 4 and 17, is that they may be looked upon as *simple fission*, while the peculiar conditions illustrated in Plate I, figs. 15, 16, 14 and 18 and Plate II, figs. 26, 27 and 28, indicate *multiple fission*.

The question now arises whether this unusual method of asexual reproduction is of any use to the malarial parasite in its struggle for existence in the human blood.

Recently Miss Lawson, studying malarial anæmia due to the subtertian parasites, came to the conclusion that each parasite destroys several red corpuscles, by migrating from one corpuscle to another.

She states that the migration takes place in all æstivo-autumnal (subtertian) infection, and she supports her contention by a series of photomicrographs, by quoting observers who have noted free parasites in the blood, and by the fact that in malarial anæmia the reduction of hæmoglobin is out of proportion to the loss of red corpuscles.

If we could substantiate her findings we should have an easy explanation for the process of simple and multiple fission which we have described above, but, unfortunately, our experience does not enable us to do this.

Neither are we able to support the suggestion that these forms only appear shortly before the death of the patient, as the present patient is alive and convalescent and never was in any danger of his life at any time of his illness.

Miss Lawson might contend that the parasite in this present case was trying to benefit by its advantageous position of living in a patient who had never previously had quinine and who had allowed the disease to progress several days without any attempt to check it.

But if this is the correct explanation we ought to have been able to see the migration, because she advises a person who wishes to observe this

phenomenon to study heavy infections and certainly the present case was a fairly heavy infection with the tertian, but not with the subtertian parasite.

We are therefore compelled to seek some more theoretical and less provable or disprovable explanation of the "tenue" phase.

We suggest that the whole process is a throw-back to a method which may have been useful to some ancestor of the malarial parasites but which to-day is entirely without practical importance and is rarely seen.

Summary.—In the above note we have recorded the history of an interesting case of malaria caused by two generations of *P. vivax* (Grassi and Feletti 1890), the parasite of simple tertian malaria.

The blood of this patient showed malarial parasites in the peculiar "tenue" phase which we believe to represent an attempt at asexual reproduction by fission, both simple and multiple. This attempt at reproduction we believe to be useless and we are unable to find any trace of the migration of the parasites as described by Miss Lawson, which if confirmed would form an explanation of the fission. We are more inclined however to look upon it as an occasional vestigial stage indicating a process which may have been useful to an ancestral form.

The patient also provided a good exhibition of *Dermatitis scarlatiniformis* due to the action of a salt of quinine.

Acknowledgments.—We desire gratefully to acknowledge the kindness of Captain McKail, R.A.M.C., in giving us the opportunity for investigating this case and of Mrs. Archibald in making the coloured illustrations for us.

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ILLUSTRATIONS.

Plate I.

Coloured illustrations all drawn from one slide before the patient had taken any quinine.

Fig. 1.—Young Trophozoite. Simple Ring.
Fig. 2.—Young Trophozoite with pseudopodium.
Fig. 3.—Small Simple Ring in smaller and darker corpuscle. May belong to the "tenue" phase.
Fig. 4.—Double infection—may represent the end of an attempt at the "tenue" phase as the rings are small and the corpuscle is dark.
Fig. 5.—Peculiar Ring. Perhaps belonging to the "tenue" phase.
Fig. 6.—Young Plasmodium.
Fig. 7.—Early "tenue" phase.
Fig. 8.—Peculiar Ring. Perhaps belonging to the "tenue" phase.
Fig. 9.—Elongated form probably commencing "tenue" phase.
Fig. 10.—Plasmodium or adult form.
Fig. 11.—Schizont.
Fig. 12.—Schizont.
Fig. 13.—"Tenue" phase.
Fig. 14.—"Tenue" phase. Late.
Fig. 15.—"Tenue" phase.
Fig. 16.—"Tenue" phase.
Fig. 17.—"Tenue" phase. With larger rings than Fig. 4.
Fig. 18.—"Tenue" phase. Showing large and small rings.
Fig. 19.—Merozoites and Nucleus de Reliquat.
Fig. 20.—Normal Erythrocyte to demonstrate magnification and coloration.

Plate II.

Photographic Illustrations from the same patient and slide as Plate I.

Fig. 21.—Patient with *Dermatitis scarlatiniformis* due to quinine. Note the swollen lips and eyelids and the profuse desquamation.
Fig. 22.—*Plasmodium vivax*—Double infection with a ring and a plasmodium form. Photomicrograph. × 1,600 diameters.
Fig. 23.—*Plasmodium vivax*—Plasmodium form. Photomicrograph. × 1,600 diameters.
Fig. 24.—*Plasmodium vivax*—Schizogony. Photomicrograph. × 1,600 diameters.
Fig. 25.—*Plasmodium vivax*—Merozoites separating. Photomicrograph. × 1,600 diameters.
Fig. 26.—*Plasmodium vivax*—"tenue" phase. Photomicrograph. × 1,600 diameters.
Fig. 27.—*Plasmodium vivax*—"tenue" phase. Photomicrograph. × 1,600 diameters.
Fig. 28.—*Plasmodium vivax*—"tenue" phase. Photomicrograph. × 1,600 diameters.

THREE CASES OF FILARIASIS IN WHICH INTRAVENOUS INJECTIONS OF TARTAR EMETIC WERE GIVEN.

By J. W. S. Macfie.

Rogers (1919) has published an account of ten cases of filariasis (presumably all *F. bancrofti*) to whom he administered intravenous injections of antimony. He found that the treatment produced "a definite diminution of the number of filarial embryos in the peripheral blood, which is probably due to a direct toxic effect on the embryos," and he considered his results "sufficiently encouraging to make it advisable to continue the observations."

PLATE II.

Fig. 21.

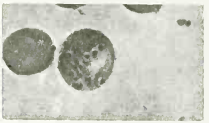


Fig. 22.

Fig. 23.

Fig. 24.

Fig. 25.

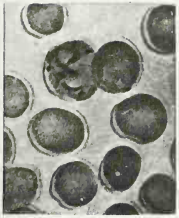


Fig. 26.

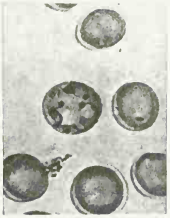


Fig. 27.

Fig. 28.

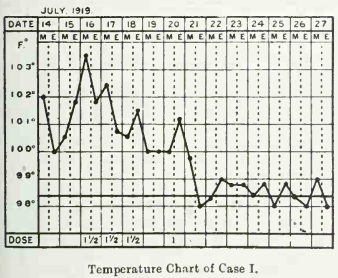
To illustrate paper on "The '*tenue*' Phase of *Plasmodium vivax* (Grassi and Feletti, 1890)," by ALBERT J. CHALMERS, M.D., F.R.C.S., D.P.H., and Major R. G. ARCHIBALD, D.S.O., M.D., R.A.M.C.

PLATE I.

illustrate paper on "The '*tenue*' Phase of *Plasmodium vivax* (Grassi and Feletti, 1890)," by ALBERT J. CHALMERS, M.D., F.R.C.S., D.P.H., and Major R. G. ARCHIBALD, D.S.O., M.D., R.A.M.C.

Some months before the publication of Rogers article I had begun an investigation on this subject at Accra, but had had to abandon it after treating only three cases with very small amounts of tartar emetic. The results, although negative, may be of some interest because they indicate the inadequacy of such small doses, and because it was possible to follow up the cases for some time after the cessation of treatment: in two of the patients moreover the embryos in the blood were of species different from those dealt with by Rogers. A brief account of the cases is therefore given below, and the data with regard to them are summarized in the table.

Case I.—The patient, a native policeman, 29 years of age, had been in hospital for six weeks suffering from a periodic fever. Blood cultures had proved negative, and so had Widal tests. His right leg was swollen and tender. On July 16, 1919, intravenous injections of tartar emetic were begun; a total of 5½ gr. was given, namely, 1½ gr. on the 16th, 17th, and 18th, and 1 gr. on the 20th July. The temperature at once began to fall, and reached



Temperature Chart of Case I.

normal levels within a week (see Chart). On July 28 the patient was discharged from hospital.

The blood was examined frequently before the antimony treatment was started and was always found to contain a few (about ten in 5 c.mm.) embryos of *Acanthocheilonema perstans*. On July 29 the embryos were still present in the same numbers as before. The patient was not seen again until October 2—that is over twelve weeks after the cessation of the antimony treatment. On this occasion he was quite well, but in his blood embryos of *A. perstans* were still present in about the same numbers.

The nature of the illness from which this man suffered is undetermined. The fever and the condition of the right leg were in some respects suggestive of filariasis, but *A. perstans* is not known to have any pathogenic action, and no other infection was demonstrated. Whatever the cause, the beneficial action of intravenous injections of tartar emetic was striking. No reduction in the number of filarial embryos, however, was detected either one week after treatment or three months later.

Case II.—The patient, a native man, about 20 years of age, an inmate of the Accra asylum, was infected with *Filaria bancrofti*. He had no symptoms referable to this infection, but in blood taken at night a fair number of filarial embryos were found.

Intravenous injections of tartar emetic were given as follows: July 31, ½ gr.; August 5, 1 gr.; August 8, 1½ gr.; August 15, 19, and 22, 1 gr. The total dose was therefore 6 gr. The patient vomited after the dose on August 8.

The blood was examined at 10 p.m. of the night following each injection. No diminution of the number of filarial embryos was noted. Subsequently the blood was examined at 10 p.m. on the 8th of September, October, November, and December. Filarial embryos were always found, and in about the same numbers. The antimony treatment did not appear to have had any effect on the filarial embryos within four months.

Case III.—The patient, a native woman, about 25 years of age, an inmate of the Accra asylum, was infected with *Loa loa* and *Acanthocheilonema perstans*. She had no symptoms referable to these parasites, but in blood taken at 2.30 p.m. there were found in 5 c.mm. from about 150 to 300 embryos of *L. loa* and about ten to twenty embryos of *A. perstans*.

Owing to the mental condition of the patient intravenous injections were impossible, but five intramuscular injections, each of ¼ gr. of tartar emetic in glycerine, were given instead, on July 23, 25, 31, August 5 and 8. The total dose, 1¼ gr., was therefore very small.

The blood was examined at 2.30 p.m. on each day on which an injection was given, and on August 12, 15, 22, and 27 measured quantities of blood (5 c.mm.) being taken up and made into thick films. The number of embryos found in these films varied considerably not only from day to day, but also in successive films made from the same drop of blood. Speaking generally, however, no alteration was observed in the abundance of the embryos in the blood. Subsequently the blood was examined on the 8th of September, October, November, and December: on each occasion embryos of both species were found in approximately the same numbers as they had been found during treatment and before the treatment was begun. The antimony treatment did not appear to have had any effect on the filaria embryos within the observation period of four months.

Rogers gave to eight of his patients doses ranging from 20·5 to 46·0 c.c. of a 2 per cent. solution of sodium antimonium tartrate, and to the remaining two 22·0 and 22·5 c.c. of colloid antimony sulphide 1 in 500. In all but one or two the dose of antimony was much larger than that administered to any of my three cases, a fact which may account for the different results. It may be noted, however, that

the diminution of the number of embryos did not correspond closely to the size of the dose given; for example, his Case 2, who received one of the largest doses of sodium antimonium tartrate, had more embryos in the blood at the end of treatment than at the beginning, and his Cases 7 and 8, who received the smallest amounts, showed a notable diminution within a day or two. In several cases also a diminution was noted very soon after the commencement of treatment, at a time when but little of the drug could have been given.

SUMMARY.

Tartar emetic, in the small doses used, appeared to have no effect on the number of embryos of *A. perstans*, *F. bancrofti* and *L. loa* in the blood; if it had any action on the parent worms the effect was not appreciable within a post-treatment observation period of three or four months.

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THREE CASES OF FILARIASIS TREATED WITH SMALL DOSES OF TARTAR EMETIC.

Case No.	Total dose of tartar emetic, in grains	Date on which treatment ended	Species of filarial embryos found in the blood	Result
1	5½	20.7.19	*Mf. perstans* ...	No diminution of the number of embryos was observed. Last examination 94 days after cessation of treatment.
2	6	22.8.19	*Mf. bancrofti* ...	No diminution of the number of embryos was observed. Last examination 108 days after cessation of treatment.
3	1¼	8.8.19	*Mf. loa and Mf. perstans*	No diminution of the number of embryos was observed. Last examination 122 days after cessation of treatment.

ULCUS TROPICUM TREATED WITH TARTAR EMETIC.

By A. MEI, M.D.

Director, Royal Italian Dispensary, Benghazi (Cyrenaica).

ULCUS TROPICUM is very prevalent among the natives of Cyrenaica. During my stay in Benghazi I have observed and treated a very large number of cases of this condition, and in most of them the microscopical examination revealed presence of *Spirochæta schaudinni*. The knowledge that tartar emetic is beneficial in various protozoal diseases, such as various forms of Leishmaniasis, trypanosomiasis and spirochætosis, led me to try it in ulcus tropicum. I have generally used the drug externally, but in two cases I have given it by intravenous injection. When tartar emetic is applied externally the treatment should be carried out as follows:—

(1) The patient must be kept at perfect rest in bed.

(2) The very abundant secretion should be removed gently from the ulcer by using dry sterile gauze and not lotions.

(3) Tartar emetic, being a caustic, should be used with care, only a small amount of the powder being applied to the surface of the ulceration and underneath the edges. The ulcerated surface is then covered with some sterilized gauze and is lightly bandaged. Cotton-wool should not be used, as in a hot country it favours the increase of purulent secretion and maceration of the tissues. This procedure is carried out, at first twice a day and then once a day, according to the amount of secretion present. The average duration of the treatment is a month.

As a rule there is a rather severe local reaction, and the patient complains of a feeling of burning, which may last from half an hour to two hours after each application. Most of the native patients, however, bear this painful sensation quite well, and they think that it gives them less discomfort than the pain so often felt in the ulcer, which often becomes very severe at night and prevents the patient from sleeping. Occasionally one comes across cases of intolerance, especially among native children and European patients. In such cases tartar emetic should be discontinued and iodoform used instead.

The tartar emetic treatment appears to have a powerful action on the spirochætes. After two or three days the organisms are present only in small numbers and in a degenerated condition. The bacilli of Vincent, on the other hand, are still present in large numbers and so are various cocci. After applying the medicament six or seven times, spirochætes become extremely rare, while bacilli of Vincent and cocci are not sensibly decreased in number. On the twelfth day spirochætes are practically absent, bacilli of Vincent are in much smaller numbers, cocci also are less numerous. After the fifteenth day, as a rule, the microscopical examination reveals complete absence of both spirochætes and Vincent's bacilli, and only a few cocci can be seen.

Apparently the drug acts chiefly on the spirochætes which quickly degenerate and disappear. The condition of the ulcer improves coincidentally with the diminution and disappearance of the spirochætes, while the bacilli of Vincent are still present and disappear much later, when the ulcer is very

greatly improved. I believe, therefore, that Vincent's bacillus has not the importance that many authorities formerly ascribed to it in the pathogenesis of ulcus tropicum. *Spirochæta sehaudinni* is the true etiological agent of ulcus tropicum. Vincent's bacilli are merely symbiotic elements with little or no pathological action. Coeci do not play any important rôle in the etiology of the condition.

Tartar Emetic by Intravenous Injection.—In two native boys suffering from ulcus tropicum I gave tartar emetic by intravenous injections, 0·06 grm. each time. I gave eight injections in one case and ten in the other. There was a distinct improvement in the ulcers, and a smear from the discharge showed a noticeable diminution of the spirochætes, which appeared to be degenerating. I must, however, state that the improvement was rather slow, and it would probably have been necessary to give a great many injections before obtaining a complete recovery. In both cases, therefore, I discontinued the intravenous injections and treated the ulcers by powdering them with tartar emetic, with very good results.

There is no need to give tartar emetic by intravenous injection when the drug acts more rapidly employed externally. I think, however, the intravenous injections may prove useful in those patients to whom the external application of the drug gives very severe pain.

I hope that medical men working in the tropics will give a trial to tartar emetic in the treatment of ulcus tropicum and will be able to confirm my results.

Secondary Malaria (S. Clavijo, *Progresos de la Clineca*, July).—This article discusses the excessive functioning of the spleen, with or without its enlargement, the localization of symptoms in the different organs, anæmia and melanæmia, the mechanism of relapses, means to foretell the impending chill and fever, the treatment and prophylaxis. In Spain and its African possessions statistics show an average annual mortality from malaria of 301,260. In 9,261 towns in Spain, malaria is present in 1,818. The expense of reclaiming malarial regions by proper engineering, &c., would be more than offset by the increased productivity of the land, to say nothing of the saving in lives. In one regiment of 1,748 men, 208·35 per cent. were given treatment during 1916 while only 90·97 per cent. required it in 1913.

Benzyl Benzoate in Amœbic Dysentery (Aughwont and Lantin, *Arehiv Int. Med.*, October, 1919). —A 20 per cent. solution of the drug was used, ten drops being given in water three times a day. Eight cases were treated with very satisfactory results. According to the authors, as well as to Asuzano, the drug appears to have a powerful action both on the trophozoite and the encysted forms of *Entamœba histolytica*.

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THE JOURNAL OF

Tropical Medicine and Hygiene

FEBRUARY 2, 1920.

TROPICAL DISEASE PREVENTION COMMITTEE.

Being a Committee to Encourage International Medical Research and the Eradication of Preventable Disease in Tropical Countries.

ACHIEVEMENTS IN TROPICAL MEDICINE.

(1) THE study of tropical medicine has made great strides within the last half century, and we now have definite knowledge as to the causation of important diseases such as malaria, typhus, plague, dengue, sleeping-sickness, endemic hæmaturia, filariasis, and ankylostomiasis. We know the specific causative agents of these diseases, their parasitic carriers, and many other factors in their natural history, which determine their permanence, spread, quiescence or disappearance. In various places indeed, notably the Panama Canal zone, the South American States, Cuba and Porto Rico, the

judicious application of this knowledge has led to the control of malaria, yellow fever and some other diseases. Thus tropical lands once regarded as deadly have been rendered healthy and suitable to the white man and fit for animals necessary to agriculture.

Knowledge not generally applied.

(2) But this knowledge has not been applied generally, nor in a reasonable and efficient way. Notwithstanding the triumphs mentioned and the improvements effected on the West Coast of Africa, in Egypt, India, &c., it is nevertheless obvious to the visitor that in most tropical lands disease is still rampant, general sanitation neglected, and specfic preventive measures unapplied. As a result diseases prevail, whose causes and methods of spread have long been known, and which may be considered rightly as easily preventable. Well-known examples are ankylostomiasis and filariasis in man and various tick-borne diseases of cattle.

Many Diseases still Obscure.

(3) There are many other diseases of which our knowledge is still inadequate. Among these blackwater fever (distinct from quinine and malarial hæmoglobinurias), pellagra, sprue, beri-beri, and leprosy may be cited as having long baffled investigation. But now approached anew, with an open mind, and in a thoroughly scientific way, they probably will not fail to be brought within the group of preventable diseases.

Danger of Spread.

(4) All tropical diseases, however restricted their present distribution, can at any time, under favourable conditions, greatly extend their range and be carried to parts of the world where they were previously unknown.

Improved transit, increasing transportation of men, animals, and merchandise are all powerful agents in spreading hitherto localized diseases. To combat this greater vigilance becomes necessary and every effort must be made to throw back invading diseases to their original localities, there to destroy them.

Islands once freed can be more easily protected than mainland, and will cease from acting as foci of infection to ports and trade routes.

Proposed Work. A Survey of the Lesser Antilles.

(5) The Tropical Disease Prevention Committee proposes to commence operations by carrying out a thorough medical survey of the Lesser Antilles. This was suggested by Dr. L. W. Sambon in 1914 in the Journal of Tropical Medicine and Hygiene, and recently in a paper on "The Sanitation of Tropical Lands," which he read at the Royal Society of Medicine on June 19, 1919, under the chairmanship of its President, Sir Humphry Rolleston, and by arrangement with the West India Committee. On that occasion Dr. Sambon made two suggestions, one with regard to the teaching of tropical medicine, the other concerning research work on the causes and prevention of disease in tropical lands. The teaching scheme has been dealt with by a special Committee appointed by the Royal Society of Medicine, which has referred it to the London School of Tropical Medicine and to the League of Nations. The other has been adopted by the present Committee.

Reasons for Choice.

(6) In this paper it was pointed out how much easier it is to carry out investigations within small areas. The phenomena of glaciation have been studied chiefly on the easily accessible Swiss glaciers. Vesuvius, the Lipari Islands—a series of small active volcanoes in the very centres of civilization—have been the chief source of our knowledge on volcanic phenomena. Similarly, small tropical islands, conveniently placed, are likely to offer the best conditions for the study of tropical diseases and for testing the value of measures deemed appropriate for their prevention and eradication.

The Committee has selected the Lesser Antilles for the commencement of its campaign, because they are a group of small islands which can be easily surveyed, and because they are dissimilar in physical features, geological structure, climate, flora, fauna, human inhabitants, diseases of plants, animals and man. They are expected, therefore, to be the most suitable field for investigation of tropical diseases not yet elucidated. Compared with vast areas and their complex conditions, small islands are especially advantageous since they include in a small compass the essential factors and diminish the total number of possible factors to be investigated. Diversity of conditions, existing in different islands where the same diseases are found, facilitates tabulation of the various factors present or absent, and their relation, if any, to the diseases in question.

Barbados suggested for Initial Preventive Work.

(7) One of the islands—Barbados—is further suggested for the application of preventive measures to eliminate ankylostomiasis, filariasis, pellagra and leprosy. This island offers specially favourable conditions, and is, moreover, free from malaria and yaws.

Probable Duration of Investigation.

(8) It is expected that the survey of the group will take about three years.

Benefit to all Tropical Countries.

(9) The researches and measures carried out in the Lesser Antilles would, of course, greatly benefit these islands, but their purpose has wider scope, namely, the application of the results obtained to the elimination of diseases throughout the tropical world.

RESPONSIBILITY.

(10) The work will be international, and the Committee confidently appeals to the people of all nations owning tropical possessions to contribute to the sum (estimated at £30,000) necessary to carry out a scheme, the object of which is to eliminate the terrible diseases infesting those lands which they hold as Trustees, and for the well-being of whose inhabitants they are responsible.

MATERIAL ADVANTAGE.

(11) There is a large amount of actual inefficiency in labour due to a high sick rate, resulting in grave economic loss and scarcity of labour, and it can be stated confidently that the lethargy and lassitude which predominate in tropical lands are largely due to preventable disease.

Nations competing actively with one another in commerce must see that the foundation of their prosperity—the health of the workers—is sound.

Annotations.

Transmission of Typhus by Lice Stools (G. Mueller and L. Urizio, *Reforma Medica*, August 23).—Experimental research indicates that the dejecta of lice are able to transmit typhus even without the bite of the insect. A laboratory accident confirmed this even more strikingly: the syringe filled with the emulsion of lice stools was being held by Urizio while Mueller was holding the guinea-pig ready for the injection, when the animal jerked and spilled the emulsion over the hands of both. Urizio was immune, having had typhus two years before, but Mueller, whose hands were irritated from other causes, developed seventeen days thereafter a classic form of typhus.

Dysentery in Palestine (Blackburn, *Medical Journal of Australasia*, August 23, 1919).—Cases of bacillary dysentery were about twice as numerous as cases of amœbic dysentery. Treatment of the former consisted in complete rest in bed and the administration every two hours of sodium sulphate or magnesium sulphate in drachm doses. Polyvalent serum was used with good results, injected in large doses. Cases of amœbic dysentery were treated by a course of intramuscular injections of emetine, followed, when necessary, by the oral administration of emetine bismuth iodide for twelve days.

Egyptian Bilharziasis (N. Hamilton Fairley, *Proceedings Royal Society of Medicine*, Vol. XIII, No. 1, November, 1919).—The author suggests that from a clinical point of view the manifestations of bilharziasis can be divided into two stages: a toxæmic stage occurring four to ten weeks after infection, and a much later stage of localized bilharziasis characterized by vesical symptoms in the case of *B. hæmatobia* and by intestinal symptoms in the case of *B. mansoni*. In the toxæmic stage pyrexia and urticaria are of common occurrence.

The author has applied to the diagnosis of bilharziasis the Bordet-Gengou reaction, devising a modified complement deviation test, for which he used at first an extract made from bilharzia worms obtained at an autopsy from an Egyptian; and later an alcoholic saline extract of the livers of infected snails.

With regard to treatment the author reports very favourably on tartar emetic, and confirms the results obtained with the drug by McDonagh and Christopherson. It is interesting to note that the author's complement deviation seems to afford an index to the therapeutic value of the drug, the test becoming practically negative after a long course of treatment.

Canvas destroying Fungi (W. Broughton Alcock, *Journal Royal Army Medical Corps*, vol. xxxii, No. 6, December, 1919).—The author gives the results of an interesting investigation he has carried out in Malta and Italy on the causation of canvas-rot. He finds that the condition is due to fungi belonging to various genera, the most common being *Macrosporium* and *Stemphylium*.

Current Literature.

TRANSACTIONS OF THE SOCIETY OF TROPICAL MEDICINE AND HYGIENE, November, 1919.

Anti-Mosquito Measures in Palestine during the Campaigns of 1917-1918 (E. E. Austen).—A very interesting account of the preventive measures put in force against malaria during the operations in Palestine. The suppression of mosquito breeding was obtained by oiling all wells, pools, &c. The results were very satisfactory.

In the discussion that followed Surgeon-Commander L. M. Morris gave an account of anti-mosquito work in the Ægean Islands. Dr. Manson-Bahr, after congratulating Major Austen on his paper, said that Major Austen had assisted in keeping Allenby's forces healthy and active through a malaria season in one of the most malarious countries in the world. Prof. Aldo Castellani while agreeing as to the paramount importance of anti-mosquito measures, said that in his experience it was of great advantage to carry out quinine prophylaxis at the same time, particularly in the case of troops taking part in a war of movement.

INDIAN MEDICAL GAZETTE.

Vol. LIV, No. 12, December, 1919.

Surgical Problems and Difficulties in the Tropics (D. J. Harries).—The author touches on several points of practical importance, and principally on

the subject of malaria simulating certain abdominal acute surgical conditions such as appendicitis, general peritonitis, and intestinal perforation.

General Vaccinia in Burma (S. Rama Iyer).—The author describes three cases of the condition. The vesicular eruption appeared five days after vaccination, and two days later the vesicles became pustules. Scabs formed four days after the appearance of pus.

Recent Researches of Hookworm Infection in Indonesia (Samuel T. Darling).—The author has had good results from the use of chenopodium oil. In his experience the initial purge may he omitted and this would lessen the work of the dispenser and permit a larger number of people to be visited. It is very important in order to exert the maximum toxic effect on the worm, that food he withheld during the morning of administration, and that the evening meal before treatment be light and digestible, leaving little residue.

Further observations on Tetanus (A. F. Noronha). —Antitetanic serum to he of value should be given at the very outset of the malady and in large doses. The carbolic acid treatment without serum has proved most disappointing.

Bulletin de la Societe de Pathologie Exotique, December 10, 1919.

Arsenobenzol Treatment for Dracontiasis by J. Montpellier and E. Ardoin.—The success obtained by Prof. Jeanselme in one case, and his desire to have further proof of the efficacy of arsenobenzol (914) in dracontiasis, led the authors to apply the treatment to four Senegalese in Algeria, all of whom had been suffering from the condition for months. Each showed at least one broken *Filaria medinensis*, and none had derived any benefit from the usual antiseptics and ether injections. Complete and rapid cure was obtained after one, two, or (in a single instance) three injections of 914, the quantity used being 0·15 gm. for the first dose and 0·3 gm. for the others. In two cases not only were the active filarial foci healed but hitherto latent worms were revealed and eliminated.

On the quickest Method of diagnosing Sleeping Sickness when on travelling practice in the Bush, by J. Schwetz.—In view of the fact that a single blood test often fails to reveal the parasite in cases of undoubted trypanosomiasis, the writer is of the opinion that palpation of the glands affords more reliable evidence to the travelling expert and does not frighten the timid native hy requiring the use of a needle. Under the difficult conditions in which the work is carried out in the bush he considers it safer to treat all cases showing typical glands than to exempt those who, on an insufficient number of tests, fail to show the organism in the blood.

Human Trypanosomiasis exists in the Eastern Forests of Peru, by E. Escomel.—Escomel has succeeded in recovering trypanosoma (probably *Schizotrypanum cruzi*) from the blood of a patient living in the heart of the forest region irrigated hy the Tahuamanu River, which also runs through the tropical zone forming the boundary between Brazil and Bolivia. Since the discovery of *Triatoma infestans* in Peru he has suspected trypanosomiasis in several cases showing characteristic clinical symptoms, hut has never hitherto found the parasite in the blood. He points out that though the disease may now be considered to exist in Peru, prophylaxis will be impossible owing to the dense character and situation of the forests.

The Isolation of and Search for Anaplasma by Inoculation of suspected Blood into Sheep or Goats, by J. Lignières.—As the result of an extensive series of experiments Lignières arrives at the following conclusions: (1) Inoculation of *Piroplasma bigeminum* and *Piroplasma argentinum* produces no effect upon sheep and goats, from whose blood it is not recovered. (2) Inoculation into sheep or goats of blood containing both *Piroplasma* and *Anaplasma* is only positive for *Anaplasma*. If from 5 to 10 c.c. of blood taken from sheep or goats between one and two months after inoculation be injected into the veins or under the skin of fresh bovidæ, a pure anaplasmosis is determined in the latter. (3) Inoculation into the sheep or goat of blood suspected of containing *Anaplasma*, and the subsequent injection of their blood into animals of the bovine species, is a simple and very easy means of seeking and isolating the *Anaplasma*. (4) This process will greatly facilitate the preparation of an epidemiological chart in any region where anaplasmosis may exist.

The Use of Monochloride of Iodine for Continuous Irrigations, by P. Kervrann.—Finding an active Dakin's solution impossible to obtain in the French colonies owing to the difficulty of preserving the lime chloride and to the moist climate, Kervrann has used the following: 30 grm. Eau de Javel titrating 49° chlorine, 20 c.c. of a 20 per cent. solution of potassium iodide, and 10 drops of concentrated HCl, dissolved in 2 litres of water. When used for continuous irrigations this solution shows rapid antiseptic and cicatricial action, and does not irritate the tissues. It costs very little and is extremely quick and easy to prepare.

The Transmission of Tunisian Canine Piroplasmosis by Rhipicephalus sanguineus, by E. Brumpt. —The disease is transmitted by adult *Rhipicephalus sanguineus*, the progeny of females who have fed on a sick animal, and the infection of the ticks is therefore hereditary. The larvæ and pupæ derived from infected females do not transmit the infection, hut they become pathogenic as soon as they reach the adult stage. Pupæ fed on virulent blood do not transmit the disease when they become adult.

The three ticks transmitting canine piroplasmosis, i.e., *Hæmaphysalis leachi*, *Rhipicephalus sanguineus*, and *Dermacentor reticulatus*, continue the hereditary transmission of the germs under the same conditions. This would seem to show that the evolutionary cycle of *Piroplasma canis* is constant, no matter what host may be employed as carrier. A number of pupæ of *Ixodes ricinus* and *Hæmaphysalis concinna*, derived from females fed upon a sick dog, did not transmit the infection.

The Cultivation of Duckweed as a Means of Combating Malaria, by Dr. Félix Regnault.—During the war Regnault noticed that a few muddy pools in the environs of Ajaccio, Corsica, were covered with duckweed and contained no mosquito larvæ, whilst others, the majority, in which the water was clear, showed no duckweed but possessed a large population of larvæ. Remembering the theory of Centanni and Ora, he put duckweed into the clear pools but it died. He then threw some cow and horse manure into them and resowed the duckweed; the latter thrived and the larvæ disappeared. When the manure was exhausted the duckweed died. Repetitions of the experiment gave the same result in every case. The author considers the disappearance of duckweed from ponds in districts ravaged by the war has much to do with the appearance of malaria, for men and cattle are gone, the organic matter in the pools is not renewed, and the water becomes clearer.

Ocular Myiasis in the Island of Sal (Cape Verd Archipelago), by Manuel Maximo Prates.—Whilst on a brief visit to the island the author's attention was drawn to ocular lesions caused by the larvæ of a fly which he was afterwards able to identify as *Œstrus ovis*. Goats would appear to be the natural host of the parasite, and the infection proves fatal to these animals when, by way of the sinuses, the brain is attacked. In man the throat and nasal passages are often affected, though less frequently than the eyes, and furuncular-like myiases are sometimes seen. The natives attribute the infection to its true cause, and smoke or chew strong tobacco to ward off the flies. The author intends to continue his investigations with a view to ascertaining whether the fly deposits an egg which subsequently hatches in the mucosa of its host, or whether the parasite is already in the larval stage when emitted.

Sleeping Sickness in the Middle Kwilu (District of Kwango, Belgian Congo) in 1918, by J. Schwetz (Congo Belge).—The report covers the period between October, 1918, and January, 1919, inclusive, during which the writer was in charge of governmental measures to check the alarming spread of sleeping sickness in the Middle Kwilu. He visited 142 villages, all on the left bank of the river, and examined 19,378 natives. The district consists of wooded, undulating country, exceptionally rich in oil palms. The population is neither robust nor intelligent, lives in multitudinous but small and entirely independent villages, and has been obviously thinned by years of sleeping sickness. *Palpalis* is surprisingly rare between Bulungu and Kwilu; to the south of the latter it abounds, even in the villages. The proportion of sick natives ranges from 1 per cent. in some villages to 38 per cent in others, and would appear to bear no relation to the presence or absence of *palpalis* in the neighbourhood. The disease has unquestionably followed the advent of the white man. No steps have been taken to deal with it except by a large British firm and generally by the missionaries. Any attempts at prophylaxis have been sporadic, episodic, and carried out by laymen. On the advice of the author the Belgian Government is sending out a medical commission to apply hygienic measures, but he considers that no prophylaxis can be effective until more is known concerning the ætiology of the disease.

An Anti-Malarial Mission in the XVIIth Region of France (1917-1918) by Dr. H. Mandoul.—The French Government, fearing possible outbreaks of malaria as a result of the importation of African natives into France during the war and the return of French soldiers from the East, appointed a commission to study the question and organize anti-malarial measures. In the Departments near the Spanish frontier, where many centres of malaria existed fifty years ago, *A. maculipennis* and Culex infest the entire district. The latter predominates in spring and autumn, the former in July. Culex is much more aggressive of the two. The anopheles hibernate in the adult stage, exist in both town and country, high and low altitudes, and temperatures varying between 14° and 30·5° C. Where duckweed, watercress or fish are present in pools, no larvæ are seen. He concludes by emphasizing the necessity for systematic mosquito destruction under present conditions, which are peculiarly favourable to the reapparance of malaria in the country.

A Further Case of Black-Grain Mycetoma (Madura Foot) in Tunisia, by Georges Blanc and Gabriel Brun.—This is the seventh instance of madura foot in Tunisia. The patient, a farmer (30), was in excellent general health. The condition apparently originated in a crushed foot in 1913, for two years later a small tumour was noticed on the dorsal surface. This was removed but a fresh growth appeared two years after. Six months before admission to hospital ulceration set in. Pressure caused a cloudy fluid, containing dark, pepper-corn-like grains to exude. On ablation of the tumour the dorsal muscles and tendons of the foot were found to be perfectly normal, and the wound healed rapidly. Microscopical examination of the grains showed them to consist of masses of mycelial filaments united by dark brown, amorphous cementing substance. Fragments of the tumour inoculated into laboratory animals produced a growth, containing one grain, on the tarsus of a pigeon. The author is inclined to classify the fungus in a neighbouring category to the *Madurella tozeuri* of Nicolle and Pinoy, from which it differs

by not liquefying gelatine, by failing to grow *in vitro* at a higher temperature than 22° C. and by the anatomo-pathological characteristics of the grain. He proposes to call it *Madurella tabarkæ*.

The Existence of Bovine Spirochætosis in Brazil. Transmission of the Disease by the Margaropus australis Tick (Fuller), by E. Brumpt.—The writer received a quantity of *Margaropus australis* from San Paulo in 1915, from which he has since obtained nine generations of ticks. After losing their power to infect with *Piroplasma bigeminum* and *Piroplasma argentinum*, and having given no spirochætosis that could be detected in the blood, the eighth generation infected a susceptible cow. The spirochætosis induced was, however, so mild that without the aid of microscope and thermometer the symptoms would have passed unnoticed. Immunity (or more correctly tolerance) is soon acquired, for thousands of infectious embryos produced no effect on the same cow seventy-five days after the first infection. The author considers that the name "*Spirochæta theileri*" should apply in every case, irrespective of the species to which the animal host belongs, and that *Spirochæta equi* and *S. ovina* should be relegated to the category of synonyms.

The Vaccination of Bovidæ against Anaplasmosis (Prof. J. Lignières).—The virulence of *Anaplasma argentinum* is attenuated by inoculation into sheep or goats, and the blood of the latter animals is then an excellent vaccine for bovidæ against the most severe forms of anaplasmosis. Sometimes a severe or even fatal anaplasmosis is produced, sometimes a mild form; sometimes the result obtained is apparently negative, the animals showing neither parasites in the blood nor discomfort, though the temperature may rise to 40° C. and more for some days. In these apparently negative cases it can be shown (*a*) that the blood of such bovidæ contains *Anaplasma argentinum* virulent for animals of the bovine species, and (*b*) that the bovidæ have often acquired a strong immunity against *Anaplasma* of high virulence. The attenuation of *Anaplasma argentinum* is in proportion to the duration of its presence in the organism of the sheep or goat. By choosing those strains which are most virulent at first, and by passing them successively and at long intervals through the sheep or the goat, such fixity in the attenuation of *Anaplasma argentinum* is obtained that they may be employed almost without danger to immunize even high grade and adult bovidæ against natural anaplasmosis.

Review.

SWANZY'S HANDBOOK OF THE DISEASES OF THE EYE AND THEIR TREATMENT. Twelfth edition. Edited by Louis Werner. London: H. K. Lewis. Price 22s. 6d. net.

This well-known text-book has been brought up to date and is now a very comprehensive elementary treatise. It is well arranged, clearly written, and contains close on three hundred excellent illustrations, including twenty-one admirable coloured figures representing various pathological and normal ophthalmoscopic appearances as well as types of ciliary and conjunctival congestion.

The chapter on glaucoma is thoroughly up to date and condenses in some thirty pages most of the modern work on the subject. Among further additions are descriptions of the corneal lesions found in acne rosacea, hypotony, a summary of the methods of diagnosis in chronic uveitis, and a résumé of Dr. Gordon Holmes's investigations of the cortical centre of vision. The operation of excision of the lacrymal sac has been rewritten, but, whilst three pages are devoted to this procedure, the indications for the operation of opening and draining the lacrymal sac from the nose, which is capable in most cases of replacing the former operation by a conservative measure, which restores the normal flow of tears into the nose, is dismissed in four lines. The article on the localization of foreign bodies has also been rewritten. In the chapter on astigmatism, the astigmometer, as a means of measuring corneal astigmatism, is alone described. With it it is necessary to make two separate observations to estimate the corneal astigmatism, whereas with Sutcliffe's more modern keratometer the two meridians are measured without rotating the instrument. Moreover, the statement that: "The corneal astigmatism . . . in most cases . . . differs only slightly from the total astigmatism" will not be endorsed by most ophthalmologists.

Apart from a few minor points like these there is little that is open to criticism.

We can recommend this book both to the student of medicine and the general practitioner and to those who are desirous of obtaining a more thorough knowledge of ophthalmology.

Medical News.

THE "Straits Settlements Gold Medal" has been awarded by the Senate of the University of Glasgow to Prof. R. T. Leiper, Helminthologist to the London School of Tropical Medicine, for his well-known researches on bilharziasis.

LEPROSY is increasing in the Aruwimi district of the Congo. In German East Africa, now occupied by Belgium, the epidemic is being held in check.

TEN of the pictures for the Stations of the Cross in the Leper Church at Pretoria, which are being painted as a gift by Mr. Frank Brangwyn, have been completed, and the other four are in course of completion.

PLAGUE is reported to have broken out in Eastern Silesia, the disease having apparently been brought in from Eastern Galicia.

(*a*)

(*b*)

(*c*)

Toxoplasma pyrogenes Castellani 1913. × 1,000 diameters.

To illustrate paper on "*Toxoplasma pyrogenes* Castellani 1913," by ALBERT J. CHALMERS, M.D., F.R.C.S., D.P.H., and Sagh (Major) A. KAMAR, M.D.

Original Communications.

TOXOPLASMA PYROGENES CASTELLANI 1913.

By Albert J. Chalmers, M.D., F.R.C.S., D.P.H.
Director, Wellcome Tropical Research Laboratories.
and
Sagh (Major) A. Kamar, M.D.
Medical Corps, Egyptian Army, Anglo-Egyptian Sudan.

In this brief note we merely desire to record the fact that we have observed in a splenic film the same bodies which Professor Castellani saw, described, figured and named in Ceylon in 1913.

Early in the present year the Sudan Government opened a new post called Jonguls in the Sennar Province, near Nyeda. This post is very isolated at present and is in the Burun country. Since going there some of the soldiers have developed a long drawn out fever which was not diagnosable. The symptoms are as follows:—

(1) Irregular fever reaching as high as 105° F.

(2) Enlargement of the spleen and sometimes of the liver.

(3) At first the patient does not mind the fever, and is not inconvenienced by it, no matter how high the temperature rises.

(4) Later he experiences headache, slight cough and some diarrhœa, but there are no gastric or hepatic symptoms.

(5) Quinine has no effect on this type of fever.

(6) Towards the end severe anæmia sets in, the gums become sore and bleed, while the breath is foul.

There have been already three deaths attributable to this fever, from which the natives say that they suffer and have had many deaths, but, pending further investigation, this native statement must be received with caution.

A post-mortem was made upon one case within one to two hours of death and a splenic film was taken.

This film when coloured by Leishman's stain revealed numerous bodies of which some are depicted in the photographs which illustrate this note. These are all lying free in the film but we have observed one in an endothelial cell.

When this brief description is compared with that given by Professor Castellani in this journal of April 15, 1914 (volume xvii, No. 8, page 113), it will be seen that as far as our description goes the two accounts are comparable, though of course ours is by no means so complete as that written in Colombo by Professor Castellani.

If his photomicrographs and coloured drawings are compared with the few photomicrographs which we reproduce in this note they will be seen to be comparable.

At present this is all that we desire to say with regard to the matter, but, naturally, steps are being taken to attempt to investigate it more fully, though the inaccessible nature of the post makes this difficult, especially as there are no postal or telegraphic arrangements.

REFERENCES.

Castellani (1913): *Journal Ceylon Branch British Medical Association*, May 31, Ceylon; (1914) Journal of Tropical Medicine and Hygiene, vol. xvii, No. 8, pp. 113-114 (illustrated by temperature chart, photographs, and a coloured plate). London.

ILLUSTRATIONS.

Three photomicrographs (*a b c*) illustrating free forms of the bodies named *Toxoplasma pyrogenes* Castellani 1913 and found in a splenic film from a case of fever with enlargement of the spleen at Jonguls, Sennar Province, Anglo-Egyptian Sudan. The measurements of these bodies agree with those made by Dr. Castellani. × 1,000 diameters.

THE OCCURRENCE OF LATERAL-SPINED BILHARZIA EGGS (*SCHISTOSOMA MANSONI*) IN URINE.

By J. W. S. Macfie.

Last August a specimen of the urine of a native man, aged 26, an inmate of the asylum at Accra, Gold Coast, was sent to me for examination. It was bright red with blood, and contained many eggs of *Schistosoma hæmatobium* and a few eggs of *S mansoni*. The specimen did not appear to contain fæcal matter, but nevertheless contamination was suspected. An unquestionably uncontaminated specimen was therefore procured on the following day in which, as before, both terminal-spined and lateral-spined schistosome eggs were found. A sample of fæces was also examined, it contained neither blood nor mucus, and no schistosome eggs were found in it.

I proposed to treat the patient with tartar emetic, but succeeded in giving only a single intravenous injection, and this was of but half a grain. The patient refused further treatment, and being insane was not amenable to persuasion. Either *post hoc* or *propter hoc* the urine cleared of blood in a few days, and the schistosome eggs became scanty. A month later the urine was found to be quite clear, free from blood, and in it there were only a very few schistosome eggs—all terminal-spined. Two months later the urine was again examined; a very few dead eggs of *S. hæmatobium* were found. At the same time the fæces were examined; neither blood, nor mucus, nor schistosome eggs were found. Up to the time of writing (December) no recurrence of the hæmaturia has been reported or observed.

There is a difference of opinion on the question of the occurrence of lateral-spined schistosome eggs in the urine. The authors of some well-known text-books assert that *S. mansoni* "invariably extrudes its eggs through the intestine," or that in infections with this parasite one finds "no ova in the urine,"

others state equally clearly that the urinary tract may be involved, and that lateral-spined eggs may be passed in the urine.

In the JOURNAL OF TROPICAL MEDICINE AND HYGIENE Bandi (1913) described the results of an investigation on bilharziosis carried out in Egypt in 1912. I have been unable to consult the original article, but from the review of it, which appeared in the *Tropical Diseases Bulletin*, vol i, p. 695, it appears that in one case he found in the urine eggs of both *S. hæmatobium* and *S. mansoni*. This paper by Bandi is presumably the same as that mentioned by Manson ("Tropical Diseases," Sixth Edition, footnote to p. 756), although his reference to it reads as if twenty-five cases had been found in all of which both lateral-spined and terminal-spined eggs were present in the urine, an experience which Manson unnaturally considered "very exceptional." Dr. G. C. Low, who reviewed Bandi's paper in the *Tropical Diseases Bulletin*, described it as "a rare event, or one might say an exceedingly rare event to find lateral-spined eggs in the urine." It is no doubt an exceptional occurrence, but one that may be met, the case briefly described above being an example.

SOME FURTHER OBSERVATIONS ON THE ÆTIOLOGY OF "PELLAGRA."

By A. VISWALINGAM, L.M.S.

IN a paper on "pellagra" (*Journal of Tropical Medicine and Hygiene*, 1st August, 1918), referring to the ætiology of the disease in this country I said: "I trust I shall not be far wrong if I express the opinion that both the 'deficiency theory' and the 'parasite theory' may hold good in the ætiology of the disease in this country. I am inclined to think, in individuals whose vitality is lowered, ... some organism gains entry into the system by way of the alimentary canal, and sets up a condition of intoxication . . . . that the disease in its early stages commences with gastro-intestinal trouble, followed later by cutaneous and mental symptoms, &c., &c." Further observations go to confirm this view.

So far, "pellagra," in my experience, has been met with only among Chinese field labourers engaged in mining or vegetable gardening. These people work and live in the fields, in open sandy districts far removed from the towns. Their diet consists of polished rice of the lowest quality, salted or dried fish, pork fat, tubers, such as sweet potatoes, and leaves of some plants which are either fresh or preserved. No fresh lime juice is ever included in the dietary, as the Chinese have a great dislike to this important and necessary article of diet. In its place, however, a form of stale vinegar called "Chinese sauce" (tau-yoo) is used. The rice is boiled in water collected from one of the ponds about the "kongsi" (Ceely line). The tubers, leaves, and the pork fat are cut to pieces and mixed together and fried in a little "kachang" oil (ground-nut oil). This, with a little salt and vinegar forms the only dish which helps the Chinese labourer in eating his rice. In the interval between the two principal meals at 11 a.m. and at 5 p.m. and whenever he is thirsty, he drinks a little "congee" (a liquid filtered while boiling the rice), and a large quantity of Chinese tea. Water in its pure form is seldom drunk by these people. Milk, butter, eggs, &c., are luxuries beyond the reach of the labourer and are never used. Milk is another article which the Chinese greatly dislike.

From the above, it will be seen that animal protein—such as lean meat, fresh fish, milk, eggs or butter is seldom used, and the chief source of the diet principles consists of polished rice, tubers, pork fat, and "kachang" oil. These articles are found to contain very little protein and that of low dietetic value. They are also found to be deficient in inorganic salts such as calcium, sodium, magnesium and chlorine; and also in soluble fats and organic acids.

The "kachang "oil, the vinegar and the fresh leaves that are included in the diet are too small in quantity to be of any use in making up the deficiency; besides they are, in themselves, of very low dietetic value. The diet thus composed is used throughout the year with no variations of any kind. It is not surprising then that adherence to such a faulty diet for a considerable period predisposes the individual to diseases, owing to the poor quality of the dietetic proximate principles, chiefly the water soluble and fat soluble vitamines.

One is asked the natural and pertinent question, "Why should 'pellagra' be solely met with among the Chinese?" This question may be answered as follows: The only other races engaged as field labourers are Malays and Tamils. The Malay, however, seldom undertakes strenuous work and seldom gets exposed to the conditions the Chinese coolie is subjected to in the mines. His diet is of a better quality and of a varied character. He eats the "kampong" rice which is merely husked without being milled or steamed. His diet, besides, consists of fish, buffalo meat, various forms of vegetables, fresh fruits, eggs, &c. The Malay being a native of the country may also perhaps enjoy an indigenous or natural immunity against infection.

The comparative freedom of the Tamil labourer is to be explained by his peculiar diet and habits. His diet chiefly consists of parboiled rice, fish, occasionally some meat, fresh lime juice or tamarind pulp, a liberal quantity of various vegetables consisting of leaves and pods, and a large quantity of gingelly oil which is of high dietetic value. This oil he not only uses to fry his vegetable or roast his meat with, but he rubs it into his scalp once in two or three days and smears his arms and legs with it, thus protecting himself against the bites of insects and the rays of the blazing tropical sun.

Scurvy, pellagra, and beri-beri are diseases that are peculiar to the Chinese and what is said with reference to "pellagra" may also explain the

comparative immunity enjoyed by other races against the other two diseases.

From careful observations one is led to conclude that faulty diet, in itself, cannot cause "pellagra" and that there is a superadded infection. If diet should be the sole factor, then the affected individual should improve and there should be no recurrence when he is removed to a hospital and placed on liberal diet, &c. But this is not so as shown by cases that were kept in hospital for considerable periods and in which the disease, far from showing any improvement, advanced and the cutaneous lesions and gastro-intestinal disturbances were seen to recur at each succeeding season. This leads one to the conclusion that, apart from diet, sunlight, &c., there must be some other factor, probably a toxin. The habits of the people, the poor dietary, the extremely insanitary surroundings in which they live, the initial gastro-intestinal troubles, the condition of chronic fibrosis seen in the organs drained by the portal circulation, and many other minor factors, favour the view that the infection must be through the alimentary canal. Whether the infecting agent is an organism which enters the gastro-intestinal system and produces a toxin which gets absorbed into the system and produces the varied symptomalogy; or whether owing to a deficiency in the vitamines, some deleterious products are created in the intestines and give rise to an intoxication of the system, it is difficult to say at present.

The seasonal recurrences of symptoms in patients removed from their surroundings and placed in a hospital with adequate diet for considerable periods of time would point to the presence of an endotoxin resulting from the evolution of some organism or more probably the establishment of a vicious circle brought about by profound metabolic changes.

Among predisposing causes may be mentioned dysentery, ankylostomiasis, malaria, and scurvy. Evidences of one or the other of those were present in at least 60 per cent. of the cases.

Infection by a Fusospirillary Organism (R. R. Mellon, *Journal of Bacteriology*, September, 1919). —A fusospirillary organism was isolated from a case in which it caused generalized infection, involving also the kidney and lung, the point of origin being presumably in the appendix. Its branching filamentous forms relate it closely to the streptothrices, while its bacillary and coccal phases relate it to the lower bacteria. The branching filaments were not cultivated from the renal abscess or the lung puncture, although many of them could be demonstrated from the material in both locations—in fact they constitute the bulk of the flora present in the lung puncture material. They were cultivated from broth blood cultures, however, partly as the result of an irregularity in the preparation of the medium and partly from a radical change in the environmental conditions at a certain stage in the culture's development.

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THE JOURNAL OF

Tropical Medicine and Hygiene

FEBRUARY 16, 1920.

A CIRCULAR BEING ISSUED BY THE TROPICAL DISEASES PREVENTION COMMITTEE.

COMMERCE AND HYGIENE.

COMMERCE cannot exist without industries, nor industries without raw materials.

A large proportion of the raw material of international commerce is produced in the tropics.

In certain tropical areas epidemic diseases trammel and at times seriously hamper economic and commercial projects.

From lack of suitable labour large areas in the tropics which should be sources of raw material, remain unutilized.

Under recent peace terms, Great Britain, its Overseas Dominions, France and Japan have incurred increased responsibilities in the development of tropical areas. It is of international importance

that these duties be well done. Adequate, willing, and healthy labour of tropical origin is essential for this purpose. Indigenous races of certain tropical countries are not suitable for productive services, hence importation of labourers from other tropical areas is requisite. The resulting flow of immigration and emigration favours interchange of diseases in ways revealed within recent years by medical and sanitary research. *Vast fields for research in this direction remain, however, unexplored.*

The near future holds great promise of increased facilities for, and rapidity of, intercommunication between countries, which cannot fail to promote the interchange of diseases and their dissemination.

Efforts towards reconstruction since the Great War give proof that tropical labour will, in common with labour in other parts of the world, demand increased social welfare. The fulfilment would require a correct appreciation of the radical doctrines of Applied Hygiene and their economical application. These doctrines must be based, therefore, not upon empirical observations, which are of evanescent value, but upon scientifically verified data.

The continuous efficiency of labour must be guarded in financial and life-saving interests to meet the conditions above stated by the following elementary precautions:—

(1) That the areas from which labourers are recruited be sufficiently under the control of Applied Hygiene to prevent, within the limits of recognized science, disease peril to the country receiving them.

(2) That both at the point of departure and arrival the labourers be subjected to skilled scrutiny as to physical fitness and freedom from morbid conditions.

(3) That the sanitary requirements of sites, dwellings, food, labour and disease prevention be met locally.

These three conditions demand the existence of organized sanitary staffs and research staffs in the countries concerned, particularly at their ports; and also require a knowledge of the movements of disease and of data secured by medical and sanitary research shall not be confined to this or that society of any nation, but shall be interchangeable with all nations. On this conviction the efforts of this Society are based, therefore it is described as "The Committee to encourage International Medical Research for the Eradication of Disease."

For liberal financial support the Committee appeals to those who recognize that in the production of raw material on a large scale in the tropics lies, side by side with the amelioration of sanitary conditions of the races concerned, the solution of numerous commercial, economic and political problems of the day.

The chief of the great benefits which medical and sanitary research have conferred upon commerce and the inhabitants of the tropics have been won by pioneers, who, without hope of reimbursement of private expenditure, or of remuneration for toil and danger voluntarily faced, have gained knowledge which has rendered possible great engineering works, and raw material production of economic importance, which may be valued in many millions sterling. If by private efforts, practically unaided by Government or the classes concerned, such results have been achieved, it is reasonable to believe that, provided with funds such as the cause merits, medical research must gain still greater victories in the cause of science and philanthropy.

The initial steps advised by the Committee, and the reasons therefor, are set forth in the accompanying pamphlet.

The following pages afford indications of the direction in which Tropical Applied Hygiene, when guided by medical and sanitary research, has proved of commercial and life-saving benefit. It also shows where increased effort is more obviously needed, but statements are necessarily confined to briefly demonstrable instances.

Engineering Works—with and without Hygiene.

During the construction of the Panama Canal from 1881 to 1889, the French lost by death 22,189 employees, at the rate of 240 per thousand. The death-rate from yellow fever varied between 7·3 and 20·6 per annum, and from malaria between 12·5 and 20·5. In the hope that West African negroes might survive the climate, 1,000 were imported; all died within six months. The same fate befell 1,000 Chinese.

The Americans commenced the work in 1904; since 1906 no case of yellow fever has occurred in the Isthmus. In the latter year the admission rate for malaria per thousand of employees was 125. In 1918 the malaria admission rate was 18. The death-rate from all causes in 1906 was 41·7; in 1918 it was 8·1 per thousand per annum.

The completion of the Canal by the Americans has been followed by the making of railways and harbours to facilitate communications, so that it has been caluculated that capital to the extent of £100,000,000 is involved.

In 1900 the mode of conveyance of yellow fever was established (Reed Board, U.S.A.) in 1898 (Ross), also that of malaria. Both facts the American sanitary expert—Gorgas—used to the full, and the result was success, whereas previously it had been failure. The root of that failure was inadequacy of medical and sanitary research at that time. The expenditure on sanitary efforts on the Canal did not exceed 1 per cent. of the total capital outlay.

Labour—with and without Efficient Hygiene.

In the Lampong District of Sumatra on certain estates the mortality amongst labourers has been reported at 90 per thousand per annum.

In Ceylon, in 1917, the average death-rate per thousand on estates was 36·4. Hookworm was one of the three principal causes of death.

In British Guiana admissions to estate hospitals for malaria gave an average of 210 during 1906-1907;

by 1915 it had been reduced by Applied Hygiene to 78.

In North Borneo, in seven hygienically managed estates, the average death-rate per thousand was 10; in two less-carefully managed the death-rate was 43 and 72 respectively.

In the mines of the Rand disease amongst natives employed was such as to cause despair of utilizing native labour. Medical research (Lister) has now rendered that possible.

In the Philippines it has been estimated, on expert evidence, that the efficiency of labour could be raised 30 per cent. by the extirpation of hookworm disease, a medical possibility.

Instancing the seriousness of malaria in the West Indies, where no organized anti-malarial measures are taken, the following extracts from the summary of Dr. W. T. Prout's Report on Jamaica, 1909, are given:—

"The total malarial deaths for the whole island during ten years amounts to 34,695.

"The average percentage of malarial deaths to total deaths is 19·7, representing nearly one-fifth of the total deaths.

"The total admissions to hospitals from *all causes* has risen from 16,103 to 21,837 in four years, an increase of 26 per cent.

"The total admissions from malaria have risen from 4,827 to 7,510, an increase of 55 per cent.

"Over 33 per cent. of the total admissions were due to malaria.

"The annual cost to the Colony of treating malarial patients in hospital is over £6,300.

"The annual loss of labour from malaria among indentured coolies on certain estates amounted to 16·9 out of every 100 working days.

"Among the constabulary, the loss of working days from malaria in two years amounted to 7,845.

"The average spleen rate among the children examined was 26·3 per cent., or over a fourth with enlarged spleens.

"There is a large interference with education on account of illness, which is preventable."

Communicable Diseases within Labour Recruiting and Receiving Areas.

India supplies a considerable proportion of labour to the Colonies and Protectorates, 164,592 adult Indians, according to the census of 1911. But this gives little idea of the rate of emigration and immigration. From *one* Presidency of India in 1916 there were 380,339 emigrants and 277,363 immigrants.

In 1917, in British India, there were 267,002 deaths from cholera, 62,277 from small-pox, 437,036 from plague, and 4,555,221 from "fevers," a large proportion of the last named due to malaria. It has been estimated that, at present, India contains at least 150,000 lepers. In its jails one death in six is due to tuberculosis.

In India, dealing with families of labourers only, and assuming that the head of each family earns only five rupees a month and his wife a smaller sum, it has been calculated that malarial sickness and death cause unproductive expenditure to the extent of more than £20,000,000 per annum.

Tuberculosis is specially prevalent in the Gilbert and Ellice Islands. It is of increasing importance on the Gold Coast. Leprosy is present in certain of the West India Islands, in Capetown, Mombasa, Fiji, and elsewhere. There are points on the West Coast of Africa whence the spread of yellow fever to parts of Nigeria may occur. The continued presence of typhoid in Georgetown remains a menace to the West India Islands. West Indians are affected with hookworm to the extent of 34 per cent. The employment of Egyptian Labour Corps may in certain areas be followed by a spread of bilharziasis. Natives returning from the mines of South Africa are likely to prove foci for importation of disease to their tribes. Plague in East Africa offers dangerous possibilities of spread.

Annotations.

The Routine Treatment of Malaria in Uganda (J. A. Taylor, *Brit. Med. Jour.*, January 24, 1920).—During the last ten years the author has adopted the following routine treatment: Calomel (5 gr.) the first night; a saline at 6 a.m. in the morning, and at 7 a.m., 8.30 a.m., 10 a.m. and noon, quinine hydrochloride is given, in 5 gr. doses. On the second and following days the same amount of quinine is given until the temperature becomes normal. Then the quinine is reduced to 15 grains daily for a week, after which 10 gr. daily are given for a fortnight and 5 gr. for two months. If the patient complains of severe headache phenacetin is administered in 5 gr. doses, and aspirin if there are severe pains in the limbs and body. The author has obtained very gratifying results from this routine treatment.

Blood Pressure in Yellow Fever (J. Birney Guthrie, *New Orleans Medical and Surgical Journal*, Vol. LXXII, No. 7, January, 1920).—The author has used Cook's modification of the Riva-Rocci sphygmomanometer, and the pressure recorded is in all cases systolic. He confirms Azenedo's findings as regards the progressive fall in the blood pressure from the first day in most cases, and especially in mild ones. The author believes that a low average blood pressure is a rather favourable prognostic sign, and that therapeutic measures to increase it should be avoided.

Trench Fever (W. Byam and H. Lloyd, *Proceedings Royal Society of Medicine*, Vol. XIII, No. 1).—The work of both authors on Trench Fever is well-known. In this paper they confirm their previous

results that trench fever is conveyed by the excreta or crushed bodies of infected lice; that the virus may enter through the broken skin or unbroken conjunctiva; that rubbing and scratching promote infection, but that the bites of lice may cause a sufficient lesion to enable infective material to enter the body.

Toxins and Antitoxins of B. Dysenteriæ (Peter K. Olitsky and I. J. Klieger, *Journal of Experimental Medicine*, January 1, 1920).—The authors have separated an exotoxin and an endotoxin from cultures of *B. dysenteriæ* Shiga. These two toxins are distinct physically and biologically, the exotoxin being relatively heat-labile and yielding an anti-exotoxic immune serum, while the endotoxin is heat-stable and is not neutralized by the anti-exotoxic serum. Moreover the exotoxin shows a specific affinity for the central nervous organs of the rabbit, while the endotoxin exerts a typical action on the intestinal tract. The authors conclude that a potent antidysenteric serum should contain antibodies against the exotoxin as well as the endotoxin.

On the Spirobacillus zeylanicus (Castellani) (Frank E. Taylor, *Journal of Pathology and Bacteriology*, vol. 22, 1919).—The author has isolated *Spirobacillus zeylanicus* (*Vibriothrix zeylanica*) from the stools of a case of chronic dysentery. He confirms Castellani's opinion that the organism is probably non-pathogenic; he considers, however, the germ to be of practical importance, as its colonies on coloured media are extremely similar to those of the true dysentery bacilli.

A Case of Chronic Abscess caused by a Nocardia (A. Pijper, M.D. (Leyden), Bethal, Transvaal).—A native was operated on three times by the author for an abscess in the neck. The micro-organism isolated in each case was a bacillary organism which could not be grown at a temperature of 22° F., but grew very slowly at 37° F. It was found to grow best on glycerin agar. The author considers the parasite to be a nocardia.

Sodium Citrate in the Treatment of Pneumonia (W. H. Weaver, *New York Medical Journal*, November 1, 1919, cx, 18).—The author having for some years treated pneumonia with sodium citrate, gives a further account of his investigations in the effects of the drug in this disease. The drug is given in large doses with plenty of water at the rate of 15 to 20 gr. an hour, or 40 gr. every two hours—sometimes more to a full-sized adult, and this is continued night and day. The author states that all the cases of lobar pneumonia of influenzal origin he treated in this way recovered.

Preliminary Note on the apparent Transmission of Leprosy to a Macaque Monkey (Burton Bradley, *Medical Journal of Australia*, November 15, 1919).—The author gives an account of the inoculation of a monkey (*Macacus rhesus*) with leprous material obtained from a leper. The monkey was inoculated in three places; the wounds healed rapidly. Some two months later rounded swellings appeared; the swellings showed no signs of acute inflammatory reaction, but were slightly pinkish and their summits slightly abraded (possibly due to scratching); there was also a lesion on the breast. Smear preparations were made from the three lesions and in each case leprosy bacilli were found. The monkey which had been anæsthesized with chloroform for the examination was left in the laboratory apparently well out of the anæsthetic, but was found dead three hours later. On a post-mortem examination being made, the result showed that apart from great congestion of the viscera accompanied by hæmorrhages, especially in the mesentery, there was no marked abnormality. Leprosy bacilli were found in the cut surface of the three lesions, in both axillary glands, and in the left inguinal gland. No pus was found in any of the lesions.

Amœbiasis Cutis (M. F. Engman and A. S. Heithans, *Journ. Cut. Dis.*, 1919, xxxvii, pp. 7 and 5).—The authors give an account of a case in which a patient, a boy of 5, developed multiple ulcers and abscesses. Amœbæ were found in scrapings from the lesions and in the pus.

The amœbæ consisted of a spherical mass of protoplasm with a sluggish amœboid movement, and seemed to possess the morphological characters of the *Entamœba histolytica Schaudinn*. Inoculations with the pus from the ulcers were made in rabbits, guinea-pigs, &c., without result. The authors consider that the ulcers were due to the pathogenic action of the amœba, which produces lesions on the skin, of two types: progressive ulceration and abscesses.

Cultural Studies in a Case of Spruc (W. W. Oliver, *Journ. American Med. Assoc.*, January 3).—From this case a yeast was recovered which corresponds to *Monilia*. The organism was isolated on glucose-agar plates from the stool, tongue, sputum and a tool abscess. Intra-peritoneal injection of a guinea-pig killed the animal in seven days, and from the liver and gall-bladder the yeast was isolated, mixed with *Staphylococcus aureus*.

Buried Tube Drainage of Elephantiasis (C. Walther, *Bulletin de l'Académie de Médecine*, November 11, 1919).—Ten cases of elephantiasis of the legs and one of the arm were treated by introducing a tube for supplementary drainage of lymph from the leg into the abdominal cavity. With a 42 cm. long trocar he tunnels a passage for it from the crural incision to the abdominal incision,

and fastens the upper end of the tube to the lip of the buttonhole in the aponeurosis. The patient stays in bed four or five weeks, the leg raised on a cushion and wound with a light bandage renewed daily to induce gentle and regular compression. When the patient is allowed to get up, the thick and sagging skin is massaged and electricity applied, and it may gradually return to its normal elasticity and aspect. In one case the skin by the end of a year of massage and electricity had resumed a completely normal aspect. All still wear an elastic stocking or compressing bandage. There has been no recurrenee in from one and a half to three and a half years in those with the longest intervals, and the fine and durable effects have encouraged him to persevere in this method of treating this hitherto almost ineurable condition. All but two of his ten patients were women, and he remarks that the only feature of the cases which suggests a bacterial origin is the age at which elephantiasis began to develop, between ten and twenty-one in all but four cases, and up to thirty-two in these.

Hydatid Vesicles Obstruct Bile Duct (F. Dévé, *Bulletin de l'Académie de Médecinc*, November 11, 1919).—A woman of twenty-eight was operated on for jaundiee that had persisted for over a year, with fluetuating intensity. The expected gallstones were not found, but the seventh day a hydatid vesiele as large as a pigeon's egg was found in the dressings, and five others presented later, the biliary fistula then healing in five weeks. There has been no further trouble during the eight years sinee. In 176 cases on record of hydatid cyst in the liver emptying into the biliary passages, in fifty-four the obstruction was protracted, from three weeks to a year in the different eases. The débris of the daughter cysts are not recognized in the stools unless the fæces are passed through a sieve. Drainage of the common bile duct has sometimes permitted the complete cleaning out of the hydatid cyst in the liver as in the case here reported. The surgeon had better not rely on this, but operate directly on the pocket in the liver. The symptoms with the jamdice do not differ from those with gall-stone obstruction, unless there may be urticaria after an attack of pain, a bulging of the liver at some point, enlargement of the gall-bladder, eosinophilia and deviation of complement.

Occurrence of Bacillus botulinus in Nature (G. S. Burke, *Journal of Bacteriology*, September, 1919). —Two hundred and thirty-five cultures were made from samples collected in five localities in central California, fifty or more miles distant from each other. The cultures covered a wide range of material, including tap water, hay, leaves, vegetables and fruits in various conditions, insects, spiders, sowbugs, snails and caterpillars, garden soil, manure from horses, hogs, and chickens, and also samples from the claws, beaks, crops, gizzard and intestinal contents of birds. Seven cultures containing *B. botulinus* were found.

Yellow Fever in New Orleans.—A passenger from Merida, Mexico, on a steamer which arrived in New Orleans, December 2, died at noon, December 4, from yellow fever. The disease was promptly recognized and all precautions were taken.

Bubonic Plague.—All port facilities of New Orleans, save five wharfs, are to be ratproofed at an expenditure of about $2,000,000. The other facilities of the board will gradually be ratproofed, the necessary funds being borrowed. The seventh case of bubonic plague reported this year in New Orleans is that of a rat-cateher in the Public Health Service, who was seized with the disease, November 27. One death from bubonic plague oecurred, November 25. The case was detected, November 22, and was sent to the isolation hospital, where serum was administered, but it was then too late to save the life of the child.

Current Literature.

THE INDIAN JOURNAL OF MEDICAL RESEARCH.

Vol. VII, No. 1, July, 1919.

Records of the Occurrence of Intestinal Protozoa in British and Indian Troops in Mesopotamia (Captain C. L. Boulenger).—The protozoa which have been investigated by the author are identified and a comparison is made between the findings in British and Indian cases. Out of 1,378 European cases, 201 were found to be infected with *Entamœba histolytica;* 264 with *Entamœba coli;* 133 with *Giardia (Lamblia) intestinalis;* 111 with *Trichomonas intestinalis;* 68 with *Chilomastix (Tetramitus) mesnili;* 8 with *Coccidium (Isospora).* Out of 906 Indian cases, 188 were infected with *Entamœba histolytica;* 276 with *Entamœba coli;* 90 with *Entamœba nana;* 74 with *Giardia (Lamblia) intestinalis;* 96 with *Trichomonas intestinalis;* 30 with *Chilomastix (Tetramitus) mesnili;* 1 with *Coccidium (Isospora).*

Report on Bilharziasis in Mesopotamia (Captain C. L. Boulenger).—An outbreak of bilharziasis among the troops in Mesopotamia in 1917-18 led to an investigation of the incidence of the disease in the Arab population, when it was found that 29 per cent. of the male population was infected. The molluse *Bullinus contortus* was found, but did not seem to be very common.

The Pharmaco-Dynamics of Quinine (J. W. Carnwall).—The author finds evidence that quinine administered to healthy rabbits for long periods of time causes damage to the cellular element of the adrenals and of the kidneys, and that the rate of disintegration of red blood corpuscles in the splcen is increased.

The Pathogenesis of Deficiency Disease. The Influence of Dietaries Deficient in Accessory Food Factors on the Intestine (Robert McCarrison).—The author has made a large number of dietetic experiments in pigeons and guinea-pigs and concludes that dietaries deficient in accessory food factors cause changes and impairment in the digestive functions. He also suggests that certain gastro-intestinal disorders in man may owe their origin to deficient nourishment.

The Pathogenesis of Deficiency Disease. The Influence of a Scorbutic Diet on the Adrenal Glands (Robert McCarrison).—According to the author's experiments a scorbutic diet induces in guinea-pigs an increase in size of the adrenal glands; a marked diminution in their adrenalin content; foci of hæmorrhagic infiltration; degenerative changes in the cellular elements of the adrenal cortex and medulla. The author concludes that a scorbutic diet impairs the functional capacity of the adrenal glands, and that this functional impairment occurs before any symptoms of scurvy appear.

Notes on a Monkey Plasmodium and on some Experiments in Malaria (R. Knowles).—The author has inoculated blood from malaria patients into monkeys, but has not succeeded in infecting these animals. A detailed description of a plasmodium found in a monkey of the genus *Semnopithicus* is given.

The Technique of the Levitation Method (Clayton Lane).—A very detailed description of the Levitation method for the concentration of hookworm eggs.

Presence of Acid-fast Bacilli in the Blood of Lepers (K. R. K. Iyengar).—The author confirms the presence of acid-fast bacilli in the circulating blood of lepers. He is of opinion that the routine examination of blood films will be found to be helpful in the diagnosis of the malady.

On the Possible Spread of Schistosomiasis in India (Stanley Kemp and F. H. Gravely).—The authors have attempted to infect artificially with miracidia of human Schistosomiasis, various molluscs found in India: *Melania tuberculata* Muller, *Melamia variabilis* Benson, *Limnæa ovalis* Gray, &c. The results have been constantly negative.

JOURNAL OF THE ROYAL NAVAL MEDICAL SERVICE.

Vol. VI, No. 1, January, 1920.

A Retrospective View of Naval Medical Conditions (Surgeon Rear-Admiral Sir Robert Hill).—This interesting paper deals with the conditions of medical service at sea from Nelson's day to the present time. Tables are given showing the casualties at the Battles of Camperdown, The Nile, Trafalgar, and Jutland.

Typhoid and Antityphoid Record for 1918-1919 (Surgeon Captain P. W. Bassett-Smith).—The author gives an account of the successful employment of the triple typhoid vaccine in the Navy from October 1, 1918, to September 30, 1919. The number of men inoculated was 17,401: single inoculations, 2,273; double inoculations, 15,128. No change was made in the composition of the vaccine either in the number of the strains or proportions, and no excessive reactions were recorded. During the year the total number of cases of enteric was forty-eight with six in which the diagnosis made on clinical signs was doubtful, and no definite records of laboratory diagnosis were given.

Quinine Tabellæ and Quinine Salts (Superintending Pharmacist F. W. Hooper).—The author gives the results of the examination of various samples of quinine supplied to the Navy and reported to be irregular in action. He is of opinion that it would be advantageous to replace hisulphate tablets by the anhydrous bi-hydrochloride. The suggestion is also made that a compound tablet containing other of the alkaloids of cinchona might be used in conjuction with pure quinine salts when malarial patients do not rapidly improve on the latter alone.

Quinine Prophylaxis (Lieut. Commander L. A. Moncrief).—The author has obtained favourable results from the use of quinine bi-hydrochloride in an acid solution, as a prophylactic. He prefers the bi-hydrochloride to the sulphate.

Heat Stroke (F. E. Fitzmaurice).—Two cases of heat stroke contracted under exactly similar conditions on board H.M.S. *Southampton* are described. One presented all the features of heat exhaustion and recovered under treatment. The other showed all the features of thermic fever and the condition ended fatally.

JOURNAL OF THE ROYAL ARMY MEDICAL CORPS.

Vol. XXXIV, No. 1, January, 1920.

Notes on Blackwater Fever in Macedonia (Colonel A. G. Phear).—The author gives an account of the incidence of Blackwater fever amongst British troops in the Salonika Command. In practically every case a history of malaria was forthcoming. Quinine did not seem to have any part in the causation of the symptoms. Treatment consisted in keeping the patient at perfect rest in bed and the administration of large quantities of fluid.

Bilharziasis and Malaria during the Palestine Campaign (Major Charles Searle).—The author gives an interesting account of the means taken to protect the troops in Palestine from these two infections. He emphasizes the necessity of all ranks receiving some training in the prevention of tropical diseases before proceeding on a campaign, especially the regimental medical officer, and advocates a strenuous after-war campaign against malaria and bilharziasis in Palestine.

Studies on the Weil-Felix Serological Test for the Laboratory Diagnosis of Typhus Fever (Captain

Arthur Compton).—Of the fourteen typhus cases in which the author carried out the Weil-Felix reaction, thirteen gave a positive result.

The Intravenous Injection of Eusol in Subtertian Malaria (Lieut.-Colonel P. S. Vickerman).—The author states that he has had good results from the intravenous injection of eusol (40 to 60 c.c.) in acute and chronic cases.

THE PHILIPPINE JOURNAL OF SCIENCE.

Vol. XIV, No. 5, May, 1919.

Some Bacteriologic Phases of the Cholera-Carrier Problem (John A. Johnston).—The author gives the results of experiments carried out in 1916 in the Philippine Islands, with the object of finding a method to facilitate the discovery of carriers. He comes to the conclusion that the oral administration of bile seems to be helpful as it causes more vibrios to appear in the fæces.

Cystolithiasis among Filipinos in Association with Dietetic Deficiency (Regino G. Padua).—The author has made a painstaking investigation into the chemical composition and into the causation of calculi in the Filipinos. He concludes that a relation apparently exists between the general dietetic inadequacy and deficiency among the Filipinos and the common occurrence of phosphatic calculi in them, in contrast with the predominance of uric acid and urate calculi in Europe and the United States.

Abstracts.

CHARACTER OF THE PREVALENT TYPHUS, IN POLAND AND ITS ASSOCIATION WITH RELAPSING FEVER.[1]

IT is well known that different epidemics of typhus have been reported as being characterized by special features; thus, the Serbian epidemic of 1914-15 showed a great tendency to gangrene of the feet; while those of Ireland have been generally associated with bronchial and pneumonic complications. What are the characters of the present epidemic in Poland? Thanks to the kindness of the local medical authorities, we have been able to see and clinically examine numerous cases of typhus, in every stage of the malady, and a large number of clinical histories and temperature charts have been placed at our disposal.

Most cases showed the typical features of the disease as described in all medical text-books and as seen by us in previous epidemics.

In Poland the incubation period seems to be—as in other countries—six to ten days; the onset, as is the case everywhere else, is usually sudden with severe frontal headache, pains in various parts of the body, occasionally rigors; rapid rise in temperature, flushed face and suffused eyes; and quickened respirations.

Judging from the clinical histories and temperature charts given to us, the course of the disease is similar to what one sees in other countries, the fever generally lasting from fifteen to sixteen days.

The rash generally appears on the fourth or fifth day. We noted several varieties of the typical rash, this confirming our experience in the Balkans. The rash is at first roseolar, and first appears on the abdomen, from there spreading to the chest, arms and legs. In many cases it seemed to be far more abundant than the rash seen in the Serbian cases. Some of the roseolar spots after a time become petechial and do not disappear completely on pressure.

In some cases the roseolar spots were slightly raised (maculopapular rash). Occasionally an erruption of sudamina was present. A case of typhus exanthematicus sine exanthema was shown to us at the Infectious Disease Hospital at Cracow. The Weil-Felix reaction was strongly positive, and the case apart from the rash had all the symptoms of the disease.

With regard to complications, it is interesting to note the comparative rarity of them in Poland, while in the Serbian epidemic of 1914-1915 they were extremely common. In Serbia the more important complications observed were, in order of frequency, parotitis, gangrene of the feet, polyarthritis and polyneuritis.

The diagnosis is generally made on clinical grounds, but in the towns and districts in which bacteriological laboratories exist, the Felix-Weil reaction is much used for confirming the clinical diagnosis. In the State Epidemiological Institute of Warsaw, Dr. Anigstein gives much diagnostic importance to the practically complete absence of eosinophiles in cases of uncomplicated typhus.

The prognosis of cases of typhus in the present epidemic in Poland seems to be more favourable than in epidemics observed elsewhere. The mortality in Poland has seldom exceeded 10 per cent. or thereabouts, while in Serbia in 1914-15 it was as high as 30 per cent.

The treatment carried out in Polish hospitals is the usual symptomatic one. The lack of nurses, and the extreme scarcity of the simplest drugs, food, and medical comforts, is much felt.

ASSOCIATION OF THE TYPHUS EPIDEMIC WITH AN EPIDEMIC OF RELAPSING FEVER.

During our tour, we have been able to observe an extremely large number of cases of relapsing fever. In fact, in certain districts the cases of relapsing fever were much more numerous than those of typhus. The co-existence of epidemics of typhus and recurrent fevers is, of course, no new

[1] Report of Interallied Medical Commission to Poland (H. S. Cumming, G. S. Buchanan, A. Castellani, F. Visbecq). Chapter III. *Bulletin of the League of Red Cross Societies*, vol. i, No. 4.

observation. It has been noticed for many years and we now know that the cause of this frequent co-existence is that both infections are carried by the same insect, the louse.

In the Balkans, in 1914-15, we had the same experience, but there the typhus epidemic ceased completely in July, while the relapsing fever continued. In Poland, in many districts, both epidemics have continued through the summer months.

Relapsing fever, though not so grave a malady as typhus, is a serious disease and in epidemic form may become a terrible scourge. For relapsing fever, as is well known, salvarsan and neosalvarsan are specifics, and one of us found out in the Balkans that tartar emetic also has a certain action on the malady, and that a combined tartar emetic-neosalvarsan is most efficacious. Unfortunately, there is a great scarcity of these drugs in Poland, and it is essential in our opinion to take steps to have all Polish hospitals provided with them as soon as possible.

As regards prophylaxis, all the measures which will be taken to stamp out typhus will be found successful in combating relapsing fever.

THE DIAGNOSIS OF CHRONIC CHOLECYSTITIS COMPLICATING CARDIAC LESIONS.[1]

By H. Babcock.

Chronic cholecystitis, with or without formation of calculi sufficient to cause distinct colic, is apt to be overlooked. Therefore, the history and symtomatology should not be disregarded, no matter how insignificant they may seem to be.

It should be kept in mind that pain of a sort different from intense hepatic colic is a frequent symptom, and also that its cause may be different. The pain now referred to is rather more a feeling of soreness or distress than an agonizing colic, and may be due to distension of the inflamed viscus instead of its attempt to expel a calculus, or to the passage of a stone along the cystic or the common duct. When due to distension of the gall-bladder or to congestion of the liver, the distress is likely to be more continuous and not so spasmodic as when caused by calculi. The location of the pain may be various and referred to the epigastrium or to the precordial region, or it may radiate upward over the anterior or posterior aspect of the chest on the right side.

Nausea and vomiting need not be pronounced features any more than is jaundice. When these do occur they are very apt to be attributed by the sufferer to acute indigestion, especially if succeeded by cessation or decided diminution of pain. These are the symptoms so commonly regarded and mentioned as " attacks of biliousness."

[1] Abstracted from the *Journ. Amer. Med. Assoc.*, Dec. 27, 1919.

In cases of cardiac disease, enlargement of the liver is the result of passive congestion and is so frequently observed that, when due to chronic cholecystitis in a cardiopath, one may very naturally attribute its increase in size and tenderness to stasis in consequence of impeded circulation. It is this very circumstance that renders the diagnosis of gall-bladder infection difficult as a complication of cardiac lesions.

The following points are of great aid in arriving at the diagnosis: in passive hepatic congestion from heart disease, the organ preserves its natural and characteristic outline unless this is prevented by adhesions or by changes produced by cirrhosis, the chronic indurative cirrhosis of long-standing portal stasis. When not cirrhotic, but merely swollen by congestion, the left lobe is palpable and tender as well as the right, and one can detect the notch separating the two lobes. This is a point of great importance in cases of cardiac, particularly valvular disease. Furthermore, when secondary passive congestion of the liver exists one is very likely to find evidences of venous stasis in other organs and tissues. Consequently, the physician should search for these before concluding that the liver changes are the result of passive congestion merely. These being absent and the symptoms being referable to the abdomen rather than to respiratory embarrassment, suspicion should be attached at once to the liver, not to the heart.

When cholecystitis is responsible for enlargement of the liver, it causes a characteristic alteration in the form of the right lobe, first described by Riedel in 1892, and hence known as Riedel's lobe. As a rule, the more acute the gall-bladder infection, the more pronounced is this change in the outline of the liver; and yet this may occasionally be very pronounced in cases of chronic cholecystitis. This alteration consists in a convex enlargement of the right hepatic lobe downward, so that the edge of the organ curves downward toward the right for a variable distance and then upward to or shortly below the margin of the ribs. In some cases this convex bulging may be small and obscured by the right rectus muscle, while in others, Riedel's lobe may reach from the median line nearly or quite to the extreme limit of the liver at the right. It may be noted also by careful palpation that the portion of the viscus lying to the left of the median line is not at all, or only indistinctly, palpable.

In pronounced instances there may be an appreciable bulging of the part of the liver overlying the gall-bladder, so that in well-marked cases it gives the impression of a rotund mass like an orange beneath the liver. If the liver or the gall-bladder is sensitive to pressure, the right rectus muscle is apt to stiffen in distinct contrast to the corresponding muscle on the left side. If the right lobe is small it may be obscured by the rigid muscle, and yet by careful palpation the liver may usually be

detected at either side of the rectus, and with the characteristic convex shape described.

In many cases, on deep inspiration, the hand can detect the softer and exquisitely tender gall-bladder itself extending slightly below the lower edge of Riedel's lobe, while in others the hand must be thrust sharply upward underneath the edge of the liver in order to come in contact with the gall-bladder and elicit evidence of pain. This procedure causes the patient to cry out and shrink from the hand, and is followed by unmistakable rigidity of the right rectus muscle.

Palpation of the liver in these cases is a fine art. Not only should the knees be elevated so as to relax the abdominal walls, but the flank should be raised either by the examiner's left hand or by a firm cushion; and the physician should avoid too firm and rough palpation, since by so doing he is likely to frustrate his own object. The lower edge and the shape of the lobe is frequently felt by merely resting the flat hand lightly on the abdomen and allowing the patient to breathe regularly and with moderate force. By so doing pain is avoided, the abdominal walls remain relaxed, and the lower hepatic border can be perceived to glide back and forth beneath the hand. If this procedure is performed at each side of the median line alternately, the state of the two rectus muscles, as well as the outline of the two hepatic lobes, may be compared.

Another sign of gall-bladder disease of corroborative value in some cases is the area of cutaneous hyperæsthesia on the right lower back. When this is present, simultaneous stroking of the two sides behind, from above downward, just internal to the posterior edge of the scapula, will elicit more or less sensitiveness of the skin at the right, over the course of the tenth and eleventh intercostal nerves. This sign has seldom been absent in cases of well-marked cholecystitis as shown by the evidence obtained by palpation of the liver.

The degree of systemic disturbance, as shown by the temperature and leucocytosis, depends on the intensity of the gall-bladder infection. If the cholecystitis is chronic, revealing its presence chiefly by digestive disorder and only moderate pain, the body temperature may be but slightly, if at all, raised, and may not even attract the patient's attention, while during the intervals between attacks of acute distress the temperature is likely to be quite normal. Indeed, it may be said that the freedom from febrile or other systemic disturbance furnishes one reason why these chronic cases are apt to escape detection.

The leucocyte count in like manner is subject to slight deviation from normal. In strictly chronic cases without marked symptoms the leucocytes are not likely to show an increase of over eight or nine or possibly ten thousand with, of course, no pronounced preponderance of the polymorphonuclear elements. One should be careful not to regard slight increase in temperature and white count in a given case of valvular disease as indicating an exacerbation of a chronic endocarditis. Except in acute instances of cholecystitis, more information is to be obtained by history, subjective symptoms, and painstaking manual examination than by study of temperature and leucocytes or even Röntgenologic examination unless, of course, the Röntgen ray is so fortunate as to disclose the presence of stones.

CHANGING THE FLORA OF THE INTESTINAL TRACT.

Scientific evidence demonstrates the difficulty of changing the intestinal flora. Without denying the possibility that certain forms of bacterial infection of the digestive tract are harmful, it is not untimely to point out again that the mere administration of *Bacillus bulgaricus* or similar organisms will not result in changing the pre-existing intestinal flora. Those organisms which produce indol and allied substances in the test tube are the same organisms that produce them in the human body with the resulting appearance of indicanuria. It was impossible in the lower animals to displace the existing intestinal flora by feeding antagonistic bacteria. On the contrary, all that was necessary to produce this desirable effect was a change in the diet of the animal. It cannot, of course, be definitely concluded that a similar course of events takes place in human beings; but probably the best means to reduce one variety and to increase another variety of bacteria in the intestinal tract is to change the character of the diet. In lower animals, when the appropriate diet is introduced, the bacterial substitution takes place automatically. F. R. Chetham Strode (*Lancet*, Jan. 10) advocates the administration of coarse uncrushed oatmeal.

Review.

A Manual of Tropical Diseases. By Aldo Castellani and Albert J. Chalmers. Baillière, Tindall and Cox, Henrietta Street, London, W.C. 1919. Third edition. Pp. 2436. Illustrated.

A third edition of this great work has seen the light and has been lying on our table for weeks running into months. We have put off a notice of the contents from time to time, being well nigh stunned by the thought of dealing with so great a mass of concentrated knowledge in a manner worthy of the subject and of the master minds that produced it. Built upon a sure foundation in the first edition the work has borne structural alterations and additions to perfection, and not only so, but these have enhanced its appearance and its usefulness. Much is new in the book, fresh discoveries have necessitated a severe weeding out of former editions, re-arrangements and eliminations to make room for new facts; yet the original plan of the book we are pleased to see has not altered in feature or in style.

The authors being faced with an enormity of material to be dealt with, it must have been a great temptation to cut out whole sections of the previous editions. One can imagine their scrutinizing the introductory section with blue pencil in hand and threatening whole chapters on, say, "The History of Tropical Medicine" and "Tropical Races," &c., with elimination. We are thankful this was not done, and hope that no curtailment of what some may regard as side issues will ever be listened to. These and such as these are the distinguishing features of the manual. Tropical diseases can only be properly studied when their whole environment is taken cognizance of; the various peoples, the climates, the environment, the geology and the fauna and flora are as necessary to a knowledge of tropical medicine as is the microscope and the test-tube.

To the Section C, dealing with parasites, much new and original matter has been added. The chapter on Trypanosomes has expanded until it occupies no fewer than 105 pages of the text. The great sub-families, the *Herpetomoninæ* Castellani and Chalmers and *Trypanosominæ* Castellani and Chalmers have been established, and the nomenclature has been altered so radically that older students will become bewildered should they take up this volume and simply glance through it. They will find old acquaintances, such as the historic name *Trypanosoma gambiense* altered to *Castellanella gambiensis*, *Trypanosoma castellanii* altered to *Castellanella castellani*, *Trypanosoma cruzi* to *Schizotrypanum cruzé* and so forth. New tribes, new genuses and a multitude of new species in this enormous section of the work fill one with amazement at the labour that has been concentrated on a subject which is only 18 years old, for it all dates from the discovery by Ford and Dutton of the *T. gambiense* in a case of Gambia fever and by Castellani in sleeping sickness. The multiplicity of species due to variety and change of environment in this section—Trypanosomidæ—is an excellent example of evolution as recounted in Chapter V, p. 112, of this volume. No one should skip these invaluable two pages of matter, for it is a concentrated essence of epitomized knowledge, yet explanatory to a degree. It is difficult to get away from the subject of trypanosomes as unfolded in this book, but we must refer to the Respiratory Spirochætes of Castellani. This great subject fills but a mere niche in the text and is almost drowned in the wealth of material, yet no greater discovery from a clinical point of view has been made in our time.

We have to look for familiar friends under headings with which we have not yet become familiar, although some of them are 20 years old. Gregarinæ coccidia and Plasmodia are to be found under the heading of chapter and page as Telosporidia. The Trematodes, the Cestoidea, and especially the Nemathelminthes (which, of course, includes the great subject of Filaria) are given ample space and are fully dealt with, and the Diptera, the all-important Diptera, with discoveries dating from over two hundred years ago until the other day, are done ample justice to. The fairy tale of the animal carriers of disease is expanded and refashioned as it is bound to be, and will continue to be for centuries to come.

The vegetal parasites occupy 200 pages of the volume and of those no less than 159 are devoted to the fungi. In no scientific work we are acquainted with, certainly in no medical text-book, is to be found anything approaching the completeness with which this subject is handled. The accuracy, the amount of work accomplished by the authors in grouping, systematizing and arranging this prolific subject is a masterpiece of editorship. The systematic study of the fungi dates from the days of Linnæus. The fungi attacking plants were chiefly dealt with, but the study of parasitic fungi in man began with the discovery of the fungus of ringworm by Remak in 1837. As years advanced so did our knowledge of human vegetal parasites, and it has reached a climax of expansion by the labours of Castellani. No one has added to our knowledge of this all-important subject to the same extent, nor shown us so exact methods of investigation as this prolific writer and earnest observer and investigator. Turn to page 1079, where the genus of Monilia (*Fungi imperfecti*) is dealt with, and but glance at page 1082, where of forty species of Monilia thirty-nine are associated with the name of Castellani, of which several are met with in the respiratory tract. Other names there are in this field of work, Brumpt, Chalmers, Blanchard, Fuckel, Fries, Vuillemin and many others, but Castellani has made the subject his own, and to him the scientific and clinical world owe a debt. It is impossible to discuss Part III of the book, devoted to the Diseases of the Tropics; this must be dealt with in a future notice, for space permits no more at present. We congratulate the authors, the publishers, and also the draughtsman upon the accuracy and delicacy of his illustrations.

We are glad the authors and publishers have seen fit to produce the book in one volume. Were the first two parts separated from the third, that is, the part devoted to diseases, there would have grown up a tendency to separate the scientific from the more practical part. He who wishes to master the subject of tropical medicine cannot afford to neglect the one part for the other; they are part of a consistent whole; the science and art of this subject must not be parted if we are to keep tropical medicine where it began, namely, a combination of laboratory findings and practice; each is the handmaid of the other, and he who would separate them will tend to produce a practitioner of a low degree, to whom the administration of drugs becomes the be-all and end-all of his existence, a mechanical man, a reversion to a type we wish to eliminate.

We have no book equivalent to this manual in any branch of medicine, and the happy combination of the gifted authors has given the world an asset of incalculable value.

J. Cantlie.

Original Communications.

SADD DERMATITIS.

By Albert J. Chalmers, M.D., F.R.C.S., D.P.H.,
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Contents. — *Introductory* — *Historical* — *Clinical Notes* — *Ætiology* — *Treatment* — *Summary* — *References*—*Illustrations.*

Introductory.—In 1917 one of us with Pekkola described a *Sudanese Dermatitis venenata* caused by *Haplophyllum tuberculatum* (Forskal 1775), and now we desire to invite attention to skin eruptions caused by grasses forming part of the Sadd (commonly called Sudd) of the Upper Nile and its tributaries.

This matter is of especial interest at the present time when attention is being paid to all natural resources throughout the Empire which may be converted into useful products.

Historical.—It is common knowledge that the White Nile above its junction with the Sobat is blocked by large masses of vegetal matter which extend into the tributary rivers named Bahr-el-Gebel, Bahr-el-Zaraf, Bahr-el-Ghazal and Jur.

These accumulations blocking the fairway of the river are called "*Sadd*" from the Arabic word سد meaning a blockage or dam. This name is variously written Sadd and Sett, but the above is correct.

The earliest explorers of the Nile do not mention Sadd, and Werne as late as 1840-1841 does not appear to have met with it.

Miss Tinné's expedition in 1863, however, was much obstructed by it, and since that day the difficulties and dangers associated with the passage of river craft through the Sadd have become well known.

This blockage is composed of fixed and swimming plants which vary in composition in the different rivers. Thus Schweinfurth, writing about 1869, says that in the White Nile it is mainly composed of grass, papyrus (*Cyperus papyrus* Linnæus 1753) and ambatch (*Herminiera claphroxylon* Guillemin and Perrottet 1832), while Garstin, quoted by Lyons, adds *Phragmites communis* Trinius 1822 and Broun, who considers the ambatch to be merely accessory, adds *Typha australis* Schumacher and Thonning 1827, which is probably the same as *T. angustifolia* Linnæus 1753. The swimming plants, according to Garstin, are composed of species belonging to the genera *Azolla* Lamarck 1783, *Ottelia* Persoon 1805, and *Utricularia* Linnæus 1735.

Only the grasses are known to cause skin irritation, and among these there are two of importance in this respect, viz., *Vossia procera* Wall and Griffith 1836, more correctly called *V. cuspidata* Griffith and *Panicum pyramidale* Lamarck; both these plants bear the Arabic name of Um Suf, meaning mother of wool.

In regard to the dermatitis caused by *Vossia procera*, Schweinfurth, writing about 1869, says that the plant derives its name "*Um Suf*" from the peculiar hairy character of its leaf sheaths. He says that these hairs have the disagreeable quality of covering the entire body of persons who may have to work in this grass with a thick down of adhesive bristles. He further states that the sharpness of these hairs and the scratches which they inflict increase the irksomeness of daily labour at the grass barrier. He, however, points out that cattle, sheep and horses prefer this grass to all other kinds of herbage.

At present we have no personal experience of this plant, and therefore are only able to quote Schweinfurth, but Prain states that some of the leaf sheaths are scaberulous with small tubercle-based hairs, which is suggestive.

With regard to the other grass, viz., *Panicum pyramidale*, Marnó in 1881 reported that the Bahr-el-Ghazal was choked by "Sadd" mainly composed of grasses, and in 1906 Broun, investigating this barrier and that of the tributary river Bahr-el-Arab, stated that the grasses were mainly composed of *Panicum pyramidale* Lamarck and *Phragmites communis* Trinius, of which the Arabic name is Bus.

When referring to the former grass, Broun drew attention to the irritant hairs on the sheaths of the lower leaves. This is the plant which we have been able to investigate in its dried condition as regards the skin irritation which it is capable of causing.

Clinical Notes.—During the present year it became desirable to investigate the chemical constituents of some of the vegetal substances composing the Sadd, and therefore a quantity of Um Suf, in a dried condition, was sent to these laboratories by the Woods and Forests Department.

After handling this dried grass the workers in the chemical section of these laboratories and the native servants complained of irritation on the skin of the arms. When these areas were inspected it was observed that a number of small bright red papules could be seen in Europeans, while in natives these papules were dark in colour.

There was no general inflammation of the affected area, and the rash was strictly confined to the parts of the body which came in contact with the hairs, and did not affect the face or other parts of the body.

If left to themselves the papules became more pronounced and lasted several days, but the cutaneous irritation subsided after about twenty-four hours or less.

Ætiology.—This section of the subject under discussion will be divided into (*a*) The Plant, (*b*) Personal Idiosyncrasy, (*c*) Confirmatory Test, (*d*) The Method of Action.

(*a*) *The Plant.*—The cause of this dermatitis is the grass *Panicum pyramidale*, which was named by J. B. P. Antoine de Monette, Chevalier de la Marck, who is commonly known as Lamarck, on p. 735 (not 745) of Volume IV of the "Encyclopédie Méthodique," which was published in Paris between the years 1783 and 1817.

This plant is noted by Broun as forming one of the important constituents of the Sadd, especially that blocking the Bahr-el-Arab.

Fig. 2 illustrates the inflorescence as shown in the dried specimen left by Broun in the Sudan Government's Herbarium, while fig. 3 indicates the pyramidal characters of the inflorescence rather better than fig. 2. Fig. 4 shows the dried plant with its rhizome and rootlets. It also shows the lower leaves covered by their sheaths.

If one of these sheaths is carefully removed, it will be seen to be covered with hairs as shown in fig. 5. These hairs, which measure about 0·056 mm. on an average in diameter, are easily detached and cover the skin with a white fluff, hence the Arab name Um Suf or Mother of Wool.

That these hairs are the cause of the irritation will be demonstrated below.

When examined by the microscope the hairs are noted to be hollow, e.g., figs. 6 and 7 show this clearly, because air has been allowed to remain in their cavities.

(*b*) *Personal Idiosyncrasy.*—This is not marked but some people appear to be more readily affected than others.

(*c*) *Confirmatory Test.*—If some of the hairs shown in figs. 5, 6 and 7 are carefully collected and rubbed into a limited area of the flexor aspect of the forearm and then quickly removed by washing, in a few minutes a sense of irritation is felt in this area, and in about half an hour definite spots appear.

On examination a number of small red papules can be observed in the white skin while in the black they appear bluish-black (fig. 1).

There is no surrounding inflammation but in the course of a few hours the papules attain the size shown in fig. 1 and in this condition they remain for a variable number of days if left untreated.

It is therefore sufficiently obvious that the dermatitis is in some way due to the hairs on the sheaths of the lower leaves.

(*d*) *Method of Action.*—If figs. 5, 6 and 7 are examined it will be observed that the little hairs somewhat resemble the ordinary sewing needle with the important exception that they are hollow as is demonstrated by the elongated air-bubble shown in each hair.

It is therefore obvious that the hairs may produce this mild dermatitis by mechanical means or that they may introduce into the puncture, so produced, chemical substances which aggravate the lesion.

Unfortunately the home of *Panicum pyramidale* is far removed from Khartoum and we have had the dried specimens only to deal with. Nevertheless it seemed to us to be worth while examining the hairs in this condition with a view to seeing whether the presence of any irritant chemical substance could be detected.

For this purpose hairs were removed from the leaf sheaths by means of a camel-hair brush. The quantity so obtained was but small, e.g., 132 grm. of dried leaf sheath only produced 0·28 grm. of hairs, i.e., 0·2 per cent.

Some of the hairs isolated were proved by experiment to give the skin eruption and irritation described above, while the remainder were subjected to the following experiments:—

(1) About 0·25 grm. of the hairs were extracted with boiling alcohol. This extract was filtered and then evaporated to dryness. The residue, which amounted to about 20 per cent. of the original mass of hairs, was taken up with a little alcohol and then applied to the skin.

No reaction was produced, but the residual hairs gave rise to the typical cutaneous eruption.

(2) A similar extract was prepared by using equal parts of alcohol and chloroform. The resulting residue was coloured and gave an aromatic resinous odour.

When applied to the skin this also produced no reaction while the hairs were as actively irritant as ever.

(3) Cold water extracts were next prepared with, and without, previous trituration with quartz powder which was added with the intent of facilitating the extraction of any substance which might be present in the hairs.

These extracts were neutral to litmus paper and were quite void of activity when applied to the skin, while the hairs themselves were still active.

We therefore failed to demonstrate the presence of any chemical agent in the dried hairs, capable of producing the skin eruption, and are therefore of the opinion that the rash is due to *the mechanical action of the hairs* on the skin.

In a certain degree we have reproduced the eruption by carefully elevating a few epidermal scales by means of a sterile steel needle from several areas of skin closely adjacent to one another. The papules produced resemble those due to the hairs but they quickly disappeared; the sensations experienced by the person experimented upon were somewhat different from those produced by the hairs.

We would, however, again invite attention to the fact that we are considering *dried* and *not fresh* hairs, which are hollow and may therefore contain a chemical agent which may act as an adjuvant to the mechanical irritation.

Treatment.—The dermatitis should be treated by washing with water to remove any hairs which may be adhering to the skin, and after having dried the skin, applying a lotion (menthol 3 grm., calamine 4 grm., spiritus vini rectificati 200 c.c. made up to 250 c.c. by water) to the affected area.

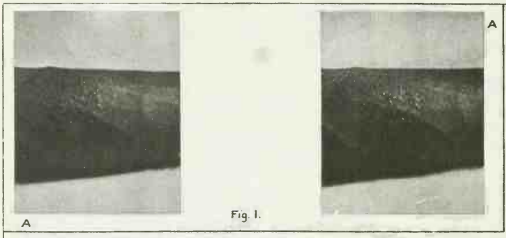

Fig. 1.

Fig. 3.

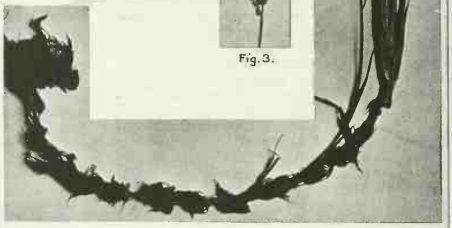

Fig. 4.

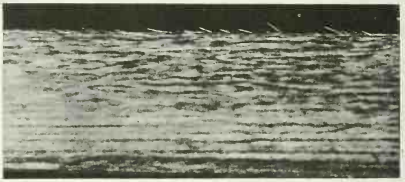

Fig. 5.

Fig. 6.

Fig. 7.

Fig. 2.

To illustrate paper, "Sadd Dermatitis," by ALBERT J. CHALMERS, M.D., F.R.C.S., D.P.H., and A. F. JOSEPH, D.Sc., F.I.C.

Summary.—We have demonstrated in this brief note that the hairs on the lower leaf sheaths of *Panicum pyramidale* Lamarck, one of the two plants called by the natives Um Suf, is capable of producing a mild form of dermatitis.

We have endeavoured to show that the action of the dried hairs is purely mechanical but we are not in a position to state whether this is so in the fresh state or whether there is an adjuvant chemical substance.

This dermatitis may be irritating to persons who have to work in the "Sadd," and therefore the treatment recommended may be found useful.

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ILLUSTRATIONS.

Fig. 1.—Experimental Um Suf Dermatitis in the Black Skin. If the two photographs are removed from the plate by cutting along the lines AA and placed in an ordinary stereoscope the papules will stand out clearly. Stereoscopic photographs. Reduced.

Fig. 2. The Inflorescence of *Panicum pyramidale* Lamarck from one of the specimens in the Sudan Government's Herbarium. Photograph. Reduced.

Fig. 3.—*Panicum pyramidale* Lamarck to show the pyramidal character of the inflorescence. From a specimen in the Sudan Government's Herbarium. Photograph. Reduced.

Fig. 4.—*Panicum pyramidale* Lamarck showing the rhizome and lower leaves with their sheaths.

Fig. 5.—A portion of one of the leaf sheaths shown in fig. 4. Note the hairs. Photograph. Slightly magnified.

Figs. 6 and 7.—Hairs from one of the leaf sheaths similar to that depicted in fig. 5. Photomicrograph, × 30 diameters.

TREATMENT OF THREE CASES OF MALIGNANT TERTIAN MALARIA WITH SPECIAL TREATMENT.

By P. J. Veale, Captain I.M.S.

Before attempting to discuss any treatment in connection with malaria, I think it is essential to have in one's mind a clear idea of the class of case under discussion, and, in this instance, establish the fact that quinine, when administered over a prolonged period, fails to eradicate the disease. Much confusion has, I think, arisen from the fact that this same disease may have two very different aspects, according to the date at which it is seen; that is to say, a completely fresh infection is a very different matter where treatment is concerned, to the same case after it has relapsed five or six times and has been taking quinine on and off for a few months. Sir Leonard Rogers [1] quotes several authorities to show that the initial attack of malaria, presumably occurring in an individual who has previously lived in a non-malarious district and who has not had occasion to take quinine, can be completely cured, and the parasites expelled absolutely from the blood, by the administration of quinine for a period of about three weeks.

Unfortunately at the present time it is almost impossible to find a case that has become infected for the first time, and even if such a case were found in a malarious place like Salonica, the chances are that he would have taken more or less quinine before he came for treatment, a fact which, as I will show later, has a distinct effect upon subsequent treatment.

It is with the chronic case with frequent relapses that we are more especially interested to-day, because in these cases quinine, except in heroic doses, seems to have lost its power, and although the parasites may be driven temporarily from the peripheral blood, yet they will return over and over again, remaining in such small numbers as not to produce symptoms until some lowering of the patient's resistance gives them a chance to multiply once more, or even appearing in such numbers as to cause symptoms during the actual administration of quinine, a fact which is well brought out in a series of articles by Lieut.-Colonel Stephens and others [2].

My own impression of malaria, as seen in Salonica, is that the majority of cases are relapses, and that quinine however administered does not effect a permanent cure, the most that one can hope for is the temporary disappearance of symptoms; the examination of the blood of cases discharged from hospital showed that 50 per cent. of all malaria cases had the gametes of *Plasmodium falciparum* present in fair numbers, and although it is not now considered that relapses can result from the continuance of gametes in the blood, yet from a prophylactic point of view their extermination is a matter of the utmost importance. Lieut.-Colonel Stephens and others [3] have shown that administration of quinine in doses of from 30 to 48 gr. daily for four weeks will cause a disappearance of crescents from the peripheral blood in a large percentage of cases; unfortunately they fail to state whether they reappeared later or not. The same authorities, however, in their introduction to a series of "Studies in the Treatment of Malaria" admit that: "Although quinine accomplishes the first of these objects (i.e., the control of the acute attack), the ideal drug, which while causing the acute attack to subside also prevents the occurrence of relapses, is at present unknown."

Falconer and Anderson [4] quote cases treated

by galyl and quinine with some success, but they insist that galyl must be combined with quinine; in a proportion of their cases disappearance of all parasites seemed to be permanent.

Sir Leonard Rogers, using intravenous injections of tartar emetic, thought that this drug was successful in destroying the gametes of malignant tertian malaria; Lieut.-Colonel Stephens and others [5] failed to confirm his results and were forced to conclude that injections of this drug had no effect.

From the authorities I have quoted I think it may be inferred that quinine by itself has not the specific action in malaria which was claimed for it, and that some other mode of treatment is essential before a definite cure can be obtained in all cases.

Returning now to the statement I made, that the administration of quinine as a prophylactic may vitiate the action of quinine as a curative, Treadgold [6] in a careful survey of the literature and his own research has shown that a large proportion of men taking quinine after an attack of malaria showed parasites in the blood; and, further, that a certain proportion in whom no such attack had occurred also had parasites in the blood, although they had been taking quinine as a prophylactic measure; and he concludes that whether quinine was given in large or small doses or not at all seemed to make little difference either to the number of relapses or to the proportion of cases in which parasites were found. Later in the same paper he quotes numerous authorities, including Sir Ronald Ross, Stitt, and Bell, to show that the general course of this disease may be adversely influenced by the previous taking of quinine. This is additional evidence showing that quinine administered over a prolonged period loses its curative action; and from personal experience, and the experience of other medical officers in Salonica, there seems little doubt that a high proportion of cases treated were of this resistant type.

Allowing then that relapsed cases of malaria do tend to become chronic through an apparent failure of quinine to produce its effect, the next consideration is to find some drug which will remove whatever cause is acting in opposition to the quinine, and so enable it to regain its original effect. With this object in view, I treated three cases of malignant tertian malaria by injecting them intravenously with a solution of disodium hydrogen phosphate and sodium chloride in a strength of 3 per cent. each, the dose varying from 60 to 100 c.c.

My reasons for adopting this line of treatment were as follows: Matko [7] states that "the protective power of urine against a hæmolytic action of quinine depends upon its content of acid phosphates," and he relates a case of blackwater fever successfully treated by injecting 120 c.c. of acid sodium phosphate 3 per cent. solution intravenously, from which it would appear that the protection afforded by the phosphate was due to some action taking place within the body. Now it is known that quinine when administered is excreted partly as unaltered drug, partly as quitinine [8], which has no action on malarial parasites, and partly as hæmoquinic acid, a powerful hæmolytic agent, to which has been ascribed the production of blackwater fever. It seemed reasonable to suppose, therefore, that if this addition of acid phosphate was successful in inhibiting hæmolysis in blackwater fever, its action might be due to the prevention of the splitting of quinine into hæmoquinic acid in the body in Matko's case; and that, if the addition of phosphate prevented this decomposition from taking place, it might also go one step further, and prevent also the formation of quitinine, and in fact that it might stop the breaking down of quinine within the body and so enable its full effect to be obtained once more, as is observed in those cases who have become infected for the first time, and who react to small doses of quinine as well.

Now, although Ramsden and Lipkin [9] have shown that in estimations of quinine in blood the concentrations obtained in chronic malarial subjects are always much lower than in healthy men taking the same dose, and suggest that this may be due to "habituation," and although Lipkin [10] has shown that various tissues, especially liver, have a considerable power of destroying quinine post mortem, yet the spleen and bone marrow in which parasites undoubtedly shelter from quinine have no such power, so that local destruction of quinine as the result of habituation cannot be advanced as the sole reason for the failure of its action in chronic cases.

There are, however, two possibilities to explain this failure: the first is that one of the products of decomposition of quinine in the body neutralizes the action of the quinine present; the other is that quinine has no action on parasites but that it is some derivative of this drug produced in the body which has; as the result of habituation, however, quinine may become broken down in some way, other than that which produces this parasiticidal substance, and so becomes inert. The addition of phosphate, then, may either prevent the production of the anti-substance to quinine, or else prevents the decomposition of the quinine in the direction which is not fatal to the parasites.

With regard to the actual cases, the patients were all sepoys in the Indian Army, who had been in Macedonia for about nine months, and had done only one malarial season in the country. In all probability, however, they had acquired some degree of immunity to the disease during their residence in India; all these cases had been given prophylactic quinine in varying doses before admission. All these cases showed the gametes of *P. falciparum* in the blood, and my primary object was to clear these very resistant bodies from the blood. I used in all cases the thick drop method for examining the blood, staining either with Leishman or Giemsa's stain, and no blood was considered negative until a drop had been systematically searched from end to end. Unless definitely stated, no quinine was administered to these cases during the time of their observation.

Case I.—Sepoy M. A.

At (*a*) Quinine acid hydrochlor. 20 gr. intramuscularly.
(*b*) Blood showed numerous M.T. gametes.
(*c*) Blood showed a few schizonts and gametes.
(*d*) 100 c.c. phosphate solution and quinine acid hydrochlor. 20 gr. intravenously.
(*e*) Blood showed schizonts absent, gametes difficult to find, and poorly staining.
(*f*) Blood showed one schizont and two gametes in whole drop.
(*g*) Blood showed a few schizonts and gametes.
(*h*) Blood showed gametes in fair numbers, no schizonts.
(*i*) 60 c.c. phosphate intravenously alone.
(*j*) Blood showed no schizonts, gametes appear less.
(*k*) Blood showed no schizonts, six gametes in whole drop.
(*l*) Blood showed no schizonts, one gamete in whole drop.
(*m*) Blood showed no schizonts nor gametes in whole drop.

Case II.—Sepoy A. S. K.

At (*a*) Blood showed M.T. schizonts in fair numbers.
(*b*) Quin. sulph. 10 gr. with iron three times a day by mouth.
(*c*) All quinine stopped until September 22.
(*d*) Blood showed no parasites.
(*e*) Blood showed M.T. gametes only.
(*f*) Blood showed schizonts and gametes.
(*g*) 40 c.c. phosphate intravenously alone.
(*h*) Blood showed schizonts and gametes reduced in numbers.
(*i*) 70 c.c. phosphate intravenously alone.
(*k*) Blood showed presence of schizonts and gametes.

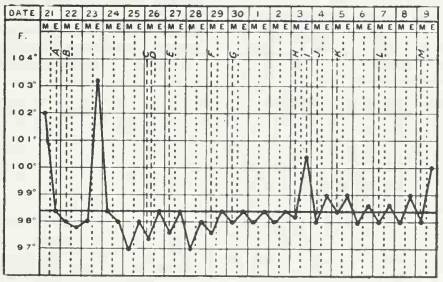

Chart I.

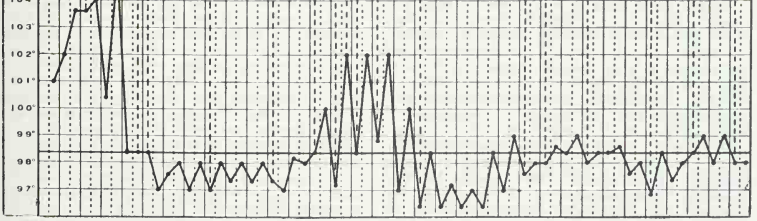

Chart II.

(*l*) Quinine sulph. 10 gr. and iron given three times a day by mouth until evening of September 23.
(*m*) Blood showed no gametes, few schizonts.
(*n*) Blood showed no gametes, few schizonts.
(*o*) Blood showed few degenerate gametes, no schizonts.
(*p*) Blood showed no schizonts, no gametes.
(*q*) Blood showed no schizonts, no gametes.
(*r*) Blood showed no schizonts, one gamete in whole drop.
(*s*) Blood showed no schizonts, no gametes.

Case III.—Sepoy.

At (*a*) Blood showed M.T. schizonts and gametes.
(*b*) Blood showed schizonts and gametes.
(*c*) 60 c.c. phosphate and quinine ac. hydrochlor. 10 gr. intravenously.

that these persisted for nine days after their return, whereas the subsequent administration of the same amount of quinine after phosphate injection caused the practical disappearance for sixteen days (the numbers of gametes observed at (*o*) and (*r*) being so much reduced, compared with their earlier presence, as to be almost negligible), so that, at any rate in this case, the administration of the phosphate seemed to produce a better result than when quinine alone was administered.

The first case also shows this in a smaller degree, because the first intramuscular injection of quinine did not cause the total disappearance of parasites from the blood; the second dose along with phosphates produced a complete, though temporary, removal, whilst an injection of phosphate alone seven days later was apparently sufficient to cause

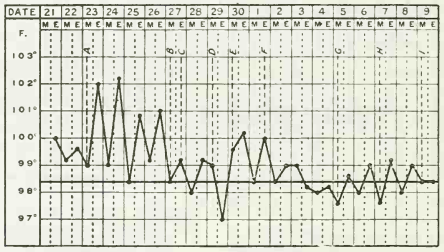

Chart III.

(*d*) Blood showed schizonts present, no gametes.
(*e*) Blood showed schizonts present, no gametes.
(*f*) Quin. sulph. 10 gr. with iron given by mouth three times a day until evening of October 3.
(*g*) Blood showed no schizonts or gametes.
(*h*) Blood showed one gamete, no schizonts.
(*i*) Blood showed four gametes, no schizonts.

In discussing these cases the first question that must be decided is: "Might the same result have been arrived at without any treatment at all?" To answer this, the patients were kept in hospital for periods varying from six to ten days, during which time they received varying amounts of quinine. Examinations of their blood showed that the parasites were not tending to disappear spontaneously from their blood.

The second question to be decided is: "Might the quinine which was administered have produced the same result by itself?" This question is well answered in the second case, in which it will be observed that the quinine administered orally for three days commencing on the 8th only caused the disappearance of the parasites for three days, and the disappearance of the parasites for a period at least equal to that which had seen the reappearance of the gametes after the first injection, and was probably acting in conjunction with some quinine still present in the tissues.

The third case, although an apparent failure, if compared with the results obtained by Lieut.-Colonel Stephens and others already quoted, with regard to the disappearance of crescents under quinine treatment, shows a very marked diminution with much less quinine; for, whereas in their cases no very marked improvement was seen in those cases taking 20 gr. daily by mouth until the third or fourth week, this case showed a considerable improvement with a very much smaller dose.

The third question which must be answered is: "If the parasites have disappeared, is this permanent, or only temporary?" Although the time at my disposal was not sufficient to enable me to follow these cases to their logical conclusion, yet the very small amount of quinine which was necessary to produce a diminution in number of gametes found, together with their gradual disappearance, suggests, I think, that, by means of the addition of phosphate to the treatment, the balance had at least been upset in favour of the patient, and that

the gametes were once more placed under circumstances which were disadvantageous to their further continuance in the blood.

Owing to the difficulty which is experienced in keeping malaria patients in hospital untreated, in order to observe the behaviour of gametes in their blood over a prolonged period, it was not possible to make control experiments, nor have I been able to find any mention in the literature of such observations, though doubtless they have been fully worked out. But it seemed from the examination of crescent cases on discharge from hospital that quinine alone had had very little action upon these bodies.

Fully conscious as I am that the results obtained were far from absolute, and the number of cases too few from which to draw conclusions, still I feel that the results were sufficiently encouraging to justify their publication in the form of a preliminary notice.

In conclusion I wish to express my indebtedness to Dr. C. Clarke for his numerous suggestions, and also to Mr. Bishan Das Sharma, who by his valuable assistance, at a time when there was a great deal of routine work to be done, made these investigations possible.

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Splenectomy in Malaria (Enrico Cartolari, *Gazzetta degli Ospedali e delle Cliniche*, September 21, 1919).—The enlarged spleen in malaria should be removed when it is causing disturbances by its excessive movability, ptosis, torsion of the pedicle or adhesions in an abnormal location. Of six such cases, in all but one the relief after operation was immediate and permanent, with no untoward by-effects. The röntgenograms show that in one case the spleen lay altogether in the right side, low in the abdomen. In two it lay horizontal, in one behind the pubis. In eighteen other cases with medical measures alone he reduced the size of the spleen more or less. When the enlarged spleen is causing disturbances it will generally be found abnormally movable, which facilitates its removal. In the one unfavourable case the much enlarged spleen was in its normal seat, but was adherent to adjacent organs and there was much hæmorrhage, the patient succumbing to the acute anæmia not long after.

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THE JOURNAL OF

Tropical Medicine and Hygiene

March 1, 1920.

THE SCARCITY OF BRITISH APPLICANTS FOR SERVICE IN THE CROWN COLONIES AND PROTECTORATES.

At the present moment the subject of the organization of the Colonial Medical Service is again to the fore. It is more than twenty years ago since Major-General Evatt, K.C.B. (then Lieut.-Col. Evatt) gave us a complete scheme drawn up with the precision which characterizes all that emanates from the brain and pen of that great organizer. General Evatt went from India, where much of his life's experience was gained, to China, where he came in contact for the first time with the work of the Colonial Medical Service. He there became impressed with the chaos which prevailed in the organization of that service throughout the Empire, and set to work to alter it. His scheme was published in the *British Medical Journal* in

the year 1897, and a reprint of the paper was issued. No notice was apparently taken of this publication, for it was in the pre-natal days of tropical medicine, and whilst yet the Colonial Medical Service was a thing of shreds and patches. It had not yet even reached the stage of the regimental doctor system which prevailed in the Army until the other day, when it was swept away and replaced by the wonderfully organized service of to-day—namely, the Army Medical Staff with its Royal Army Medical Corps complete in every detail.

As no one seemed to pay any attention to General Evatt's scheme, the writer brought it forward in 1898 at a meeting at the Imperial Institute, with Sir Joseph Fayrer, Bart., in the chair, and at the same time the writer dwelt upon the necessity for a School of Tropical Medicine in England to train civilian practitioners and the members of the Colonial Medical Service in the rudiments of tropical medicine. The two schemes, in the writer's opinion were really one, for as the Army held their great school at Netley (now at Millbank, London), so a special training should be afforded to all doctors before going out to civil work in the tropics. The result of that meeting was a petition to Mr. Joseph Chamberlain, the Secretary of State for the Colonies at that time—a petition which by the energies of the Minister and Sir Patrick Manson saw its fulfilment twelve months later in the establishment of the Schools of Tropical Medicine in London and Liverpool. The scheme enunciated by General Evatt saw its partial fulfilment by the establishment of the West African Medical Service, a service which shows what can be done when the subject of organization is taken up by master minds.

The extension of this exemplary nucleus in West Africa to the Imperial needs is only a question of time and sympathetic handling by capable men. At present it is at a standstill owing to puny objections brought forward; molehills being magnified into mountains, and set up as irremovable obstruction to the formation of a great service.

A service without a head, a focus to work towards, a goal to aim at, is no real service in the accepted meaning of the word. There is no tradition to uphold, and a service without a history and no possibility of contributing towards even the creation of such, has but a soulless existence in which the members do their daily task, but without a future as far as the establishment they serve is concerned. There is no one to encourage them and say "Well done" when they deserve it. In the Navy, Army, and Indian Medical Service there are promotions and decorations to reap—these are encouragements which are stimulating to everyone, and especially dear to the young man with a career before him, with a service to work for, a good name for that service to fight for, to defend and to honour.

In the Colonial Medical Service there is no standard to salute, there is no Director-General in command, but a group of individuals striving to exist sans (sufficient) pay, sans ambition, sans power to do for their families as they ought to be done by, sans most of the objects that make life worth living.

And all this can be changed by the stroke of a pen. The writer says this advisedly, knowing well the difficulties; for this is not an opinion formed in a moment of fervour, for the difficulties *are* many; to most people they appear great; by some they are considered to be insurmountable. The same has been said of well-nigh every attempt at organizing any public body. It has, moreover, opponents, bitter opponents, to any change or amalgamation of interests. It is unnecessary to enter into all the difficulties, and to repeat what has been so often repeated *ad nauseam* about the impossibilities of removing these difficulties is but waste of space and time. What is wanted is construction, not obstruction; anyone can do the latter, but to find men with the constructive ability is the *rara avis*. The most recent promise of advance is to be found in the grouping schemes—namely, West Africa and East Africa Brigade, Division or Group; the South African; the West Indian; the Indian Ocean (Ceylon, Mauritius, &c.); the Malayan, the Far East, the Pacific Ocean Divisions or Groups.

Even within these groups difficulties will be raised on trifling points, trifling to the organizer, but magnified locally into mountains by the "parish-pump" minds warped by trumpery matters, such as exchange, currency, language, family matters, the question of private practice, of whole-time and of part-time service, &c. Still, there are hopes in the grouping system of a solution of the problem. But even were we successful in forming these, it is but a step towards completion, for these scattered groups if left to themselves constitute but a collective form of individualism, a transfer from an individual to a group of individuals continuing separatism, and thereby preventing the formation of a great service—a Colonial Medical Service. What is wanted is an Imperial head and centre in London, as other Imperial services have. A general staff must be formed with a Medical Director-General in command. The consulting board we have at present in connection with the Colonial Service must be no mere board for medical consultations, but an administrative and executive board of lay officials, but one consisting of medical men to whom is handed over the direction and control of this service. Who does direct it now? is a pertinent question. Is there a head? "Well, there are so many departments, you see." "Sir —— has charge of this section." "Mr. —— has charge of that," and what is many persons' business is nobody's, and everyone shuffles out of responsibility. Such has been the history of the growth of all departments, but the time comes when such methods will not do, and in connection with the Colonial Medical Service such a time has arrived now. Medical men will not come forward to join a haphazard service such as we have now. There is nothing definite to put before a young man at present that is likely to attract him to take service in the Crown Colonies or Protectorates with an uncertain future. Several "high" positions

in the senior ranks are applied for by men of ability, but to jump into a high position over the heads of men who have done the junior work and for many years served the colony well is not a desirable position for any man who thinks at all of his fellow-men's feelings and prospects.

It is to be hoped that the authorities will never consent to continue the bad old system at one time in vogue in the Army Medical Service. It is to be hoped also that we shall never hear again a similar threat held over the heads of British doctors as was the case only a score or so of years ago, when the Army medical men were moving for a better organization and the formation of a real Medical Corps, that the then Adjutant-General of the Forces, the foremost soldier of his day in the Empire, said, "If you push the matter, I will apply to Germany for doctors and fill the ranks of the Medical Service of the Army with German doctors." The Army Medical Service had a bitter fight for their position, let us hope the Colonial Medical Service will be better treated; but however it may be settled, be it amicably or otherwise, it has to be settled, and that only in one way. If not being inundated by German doctors, there are doctors of other nationalities creeping into the Crown Colonies' service; if that is the most advantageous way let it continue, but it cannot be expected that good British medical men will jump at appointments in a service so irregularly constituted.

J. C.

Annotations.

The Underlying Causes of the Narcotic Habit (Alexander Lambert, *Modern Medicine*, vol. ii, No. 1, 1920).—The author is of the opinion that the solution of the drug problem lies in the more personal consideration of the drug taker, especially of the causes which led him to become addicted to the drug. He finds that in youth the cause is the desire for exhilaration and enhanced enjoyment of life; after thirty it is to cause forgetfulness of life's troubles. Cocaine, heroin and morphia are the drugs chiefly used. He states that nearly 80 per cent. of morphia addicts have acquired the habit through taking the drug for medicinal reasons.

Observations on the Cerebro-spinal Fluid of Acute Disease (W. W. Herrick and A. M. Dannenberg, *Journ. Amer. Med. Assoc.*, 1919, No. 18, p. 1321).—The authors have examined the cerebro-spinal fluid in a number of acute conditions, such as lobar pneumonia, influenza, tonsillitis, parotitis, &c. In about one-third of the cases some variation from normal was found as regards pressure; and a certain degree of pleocytosis and heightened globulin content was observed. The authors consider that a diagnosis of meningitis should never be made on small variations from normal in the cerebro-spinal fluid unless definite clinical symptoms be present.

The Incidence of Syphilis as manifested by routine Wassermann Reactions on 2,925 Hospital and Dispensary Medical Cases (A. B. Day and W. McKilt, *American Journal of Syphilis*, 1919, No. 3, p. 595).—The authors found that 30 per cent. of white males and 16 per cent. of white females gave a positive Wassermann. Of 200 coloured males 48 per cent., and of 273 coloured females 40 per cent., were positive. About 15 per cent. of the cases so examined did not show any clinical evidence of the disease.

Chronic Diarrhœa due to Syphilis (H. Lisser, *American Journal of Syphilis*, 1919, No. 3, p. 592).—The author describes a chronic case of diarrhœa with fatty stools occurring in a woman 26 years of age. All the usual causes of enteritis could be excluded, and the author suspected that the condition might be due to syphilitic lesions of the intestine and pancreas. The patient was given an arsphenamine and mercury treatment, and all the symptoms disappeared.

The Fate of Bacteria introduced into the Upper Air Passages (Arthur L. Bloomfield, *Bulletin of Johns Hopkins Hospital*, vol. xxxi, No. 3471, January, 1920).—The author, who made a detailed research into this subject, came to the following conclusions: (1) *Bacillus coli* and *Staphylococcus albus* swabbed on the tongue or nasal septum usually disappeared within twenty-four hours. (2) *B. coli* and *S. albus* introduced into tonsil crypts could be recovered after somewhat longer intervals. (3) In no case was a permanent carrier state set up. (4) Inert particles disappeared at about the same rate of speed as the bacteria. (5) The organisms probably disappear because they are mechanically removed more rapidly than they multiply. (6) The disposal of *B. coli* and *S. albus* illustrates a mechanism radically different from that effective in removing *Sarcina lutea*.

A Case of Non-parasitic Hæmatochyluria (H. H. Hampton, *Johns Hopkins Hospital Bulletin*, vol. xxxi, No. 3471, January, 1920).—The author, in recording a case of this extremely rare condition in a young woman who had spent her life in the mountains in Virginia, was satisfied that the case was a non-parasitic one. He found that the leak in the lymphatic system was located in the right kidney. On the patient being put on a fat-free diet and on starvation the urine became fat-free, blood-cells and albumin persisting. Increased water intake and urine output increased the "fat loss," while it was noted that posture influenced but did not control the amount of lymph leakage.

Botulism from Eating Canned Ripe Olives (Chas. Armstrong, R. V. Story, and Earnest Scott, *Public Health Reports*, Vol. 34, No. 51, December 19, 1919).—Eleven persons who took part in a dinner party at Canton, Ohio, and three employees at the

club where the dinner was held (who also, it was found, had partaken of the infected food), displayed severe symptoms of poisoning, and six deaths took place within eighty-seven hours. After an exhaustive investigation of each item of the menu, the cause was found to be in olives of which they partook. These ripe olives were placed on the table in three dishfuls and were eaten raw, some guests taking four or five in spite of the unusual taste. There was a striking correspondence between the amount of olives eaten and the time elapsing before death, or in the case of recovery, of the severity of the attack. In the seventh fatal case, in which death took place 174·5 hours after the dinner, only 0·5 of an olive had been eaten. It was noted that two of the cases that recovered after eating one and two olives respectively, had partaken of alcoholic drinks during the evening; later, on making animal experiments, the author found that alcohol has the property of neutralizing the toxin when mixed *in vitro*. The remaining olives were subjected to a chemical examination with negative results. Inoculation experiments were then made on guinea-pigs and the high toxicity of the olives was demonstrated. Cultures were then made from the olives and brine and an organism was isolated which is considered to be a strain of *Bacillus botulinus*: this opinion was confirmed by Sisco of the Harvard Laboratories.

Current Literature.

Indian Medical Gazette.

Vol. LV, No. 1, January, 1920.

Further Notes on the Treatment of Diabetes (E. E. Waters).—The author recommends the fasting treatment of diabetes, which has given him good results. He gives useful suggestions as to how the restricted diet can be made most bearable to the patient. Where acidosis or diabetic coma supervenes the author advises that the bowels be kept freely open, while liquids (tea, coffee, thin broth, water) must be freely given up to 1,000 c.c. every six hours; if necessary the fluid may be given as normal saline or tap-water per rectum, or even intravenously or subcutaneously. The author does not favour the administration of alkalis.

Quinine Prophylaxis and the Treatment of Malaria in a Coolie Population (Charles E. P. Forsyth).—The author is convinced of the uselessness of quinine prophylaxis among the labour gangs in the tea gardens, mainly because of the difficulty of ensuring that the quinine given is actually taken. While admitting the importance of quinine administration for European or educated natives, he is of opinion that among natives of a low class the use of quinine as a prophylactic is waste of time and money and should give place to measures against the mosquito.

An Epidemic of Fifty-four Cases of Relapsing Fever observed in Birjand, East Persia (A. Sargood Fry).—The author describes an epidemic of relapsing fever among troops in East Persia. He considers that the infection may be carried by ticks as well as by lice. Arsenobillon may be used in the treatment of a number of cases with good results.

Cinchonidine in Malaria (D. S. Ollenbach).—Injections of cinchonine bihydrochloride were used by the author in twenty-four cases of malaria, including two children, with entirely successful results.

Influenza (Bhupal Singh).—The author, in describing an influenza epidemic at Meerut in 1918, divides the cases into three groups: (*a*) mild, (*b*) serious, and (*c*) fulminating cases, which latter presented serious symptoms from the first and were scarcely distinguishable from pneumonic plague. The mild cases were marked by fever (100° to 103° F.), and some congestion of the throat. The fever usually begau to subside on the third day. The serious cases generally began as mild cases and on the third day became worse (temperature, 102° to 105° F.), with breathing more and more hurried, and often cyanosis. Some of these cases, after keeping up a high temperature for a week, began to improve; other cases went from bad to worse. The fulminating cases were hardly distinguishable from pneumonic plague, and they all terminated fatally. Mild and severe cases did well on salicylates.

Journal of Parasitology.

Vol. VI, No. 2, December, 1919.

Experiments with Steam Disinfectors in destroying Lice in Clothing (R. H. Hutchison).—The author has made at Camp Mills, L.I.N.Y., a lengthy investigation into this subject. He finds that steam penetration at 75° C (167° F.) will destroy all eggs and active stages of body lice.

On the Resistence to Desiccation of the Intermediate Host of Schistosoma japonicum Katsurada (William W. Cort).—The author has made an interesting examination of snails infected with the cercariæ of *S. japonicum* and comes to the following conclusions: (1) The resistence to desiccation of *Blandfordia nosophora*, the intermediate host of the Japanese blood fluke, *S. japonicum*, is limited to about three months. (3) Desiccation unfavourably affects the cercariæ within the snail, and infected snails succumb more quickly than uninfected. (3) Individuals of *Blanfordia nosophora* will voluntarily leave the water and become dry under unfavourable conditions. (4) Measures for the control of Japanese schistosomiasis by draining the breeding places of *Blanfordia nosophora*, would be fully effective only if these places were kept dry at least three months.

Sarcosporidiosis in an East Indian (S. T. Darling).—Sarcosporidia were found at the post-mortem of an East Indian coolie who had come from India and the Federated Malay States, and who had been admitted to hospital for severe anæmia.

BULLETIN DE LA SOCIETE DE PATHOLOGIE EXOTIQUE.
January 14, 1920.

A Few Facts concerning Vaccinal Prophylaxis against Anthrax in Morocco (Th. Monod and H. Velu). —Experiments on 11,100 sheep, 3,750 pigs, and 16,500 cattle showed that the vaccines supplied by the Pasteur Institute are effective against anthrax in Morocco, but that the immunity only lasts from eight to ten months, and perhaps less. To maintain the immunity, therefore, it would be necessary either to re-vaccinate twice a year, to give a second injection consisting of a double dose of No. 2 vaccine, or to administer a further injection of a very slightly attenuated culture. Out of 31,500 healthy animals there were no deaths after vaccination, but of 100 suspected cases two died, probably because the dose of serum injected was insufficient.

A further Case of Rabies in Senegal (Teppaz).—This case (the third of its kind recorded by the author) is cited in refutation of the theory prevalent in Senegal that rabies does not exist in that country. The dog was a fox-terrier who had been imported from France two years before. It showed definite symptoms of rabies and died four days after the condition was first noticed. At autopsy the nerve centres were found to be markedly congested. An emulsion from the dog's brain proved fatal to a rabbit, and a second rabbit died after inoculation with material from the first.

Glioma of the Brain in a Negro (F. Van den Branden).—The patient, a negro of about 40, had lived in the Belgian Congo for ten years. He complained of intense headache and showed paresis of the legs to a very slight extent. Pulse slow; temperature slightly above normal. Lumbar puncture produced clear fluid, which showed no abnormal lymphocytosis or albumin. The man became very rapidly emaciated, and entering into a semi-comatose condition died after a fortnight in hospital. On opening the skull two typical tumours, showing all the characteristics of glioma microscopically, were found in the posterior lobe of the right cerebral hemisphere.

Cyanide of Mercury in Blackwater Fever (Fernando R. Munoz).—The dose employed was half a centigramme, unaccompanied by other medication. A second injection was given twenty hours after the first, and a similar period was allowed to elapse before the third if a third were necessary. In the five cases treated in this way the results were uniformly satisfactory. The fever abated within a few hours after the first injection and the albumin disappeared from the urine; the latter rapidly lost its reddish-brown colour and became successively strawberry red, bright orange and picric yellow.

Experiments in the Treatment of Sleeping Sickness with Collobiase d'Antimoine (F. Van den Branden).—"Collobiase d'antimoine" is a colloidal antimony manufactured by Dausse, Paris. It proved to possess no trypanocidal action in the doses tested.

The Importance of the Course run by the Leucocyte Count and of the Blood Changes in the Clinical Diagnosis of Relapsing Fever (Dr. E. W. Suldey). —Though the relapsing fever of the West Coast of Madagascar presents the same clinical picture as tick fever, the transmitter of both being *Ornithodorus moubata*, the diagnosis of the former is difficult on account of possible confusion with malaria, typhoid, and other febrile conditions. In studying the daily leucocyte count of a large number of positive cases in which the spirochæte was recovered, the neutrophile polynuclears were observed to increase in number during the attack by from one-third to double the former quantity, and to drop suddenly with the temperature; the lymphocytes become considerably fewer during the feverish phases, but rapidly increase by 35 to 50 per cent. within three days after a fall in temperature; the eosinophiles almost disappear when the fever is at its height, but increase during the apyretic period; the large mononuclears and the macrophages appear to reach a maximum at the beginning of the apyretic period, and descend to a minimum about twenty-four hours before a fresh attack.

Method of Search for scanty Malarial Parasites in the Peripheral Blood (N. H. Swellengrebel).—The method consists in causing carrier anopheles to suck the blood of the person to be examined. After four days or more the stomachs of the insects are opened. If oöcysts are present the species of parasite is identified by the pigmentation. The parasite of quartan malaria is the only one likely to cause any difficulty, its pigmentation being intermediate between that of *P. vivax* and *P. falciparum*. Two cases are given as example.

A Clinical Study of Relapsing Fever in the Province of Se-chuen (Western China) (Jouveau-Dubreuil).—No case of relapsing fever was recorded in China until 1904. Far from being rare, however, it would appear to ravage every province in which laboratories and a medical organization exist to identify it. It is quite common among the poorer classes; very few cases occur among the better classes. In the spring the fever becomes epidemic; it decreases through the summer, and as the winter advances it becomes almost extinct. These variations are coincident with those in the number of lice infesting the poor among the population. As mosquitoes, fleas and bugs are ubiquitous and affect all classes alike, it is improbable that they are transmitting agents. The mortality is very high. Prophylaxis consists in exterminating the louse, an impossibility until some remedy is found for the extreme poverty at present prevailing among a very large class of the people.

A Case of Spontaneous Infection of a Dog by Trypanosoma Marocanum (Sergent, Lhéritier and Belleval, 1915) (P. Delanoë).—A dog, greatly emaciated and with a double keratitis, showed numerous trypanosomata in its blood under the microscope, and was killed. Two guinea-pigs and a young rabbit died, two, three and a half, and

three months respectively, after inoculation with material taken at autopsy. The trypanosoma seen in all the animals closely resembled that previously observed in a spontaneously infected horse. The interest of this case lies in the fact that it is the first of its kind observed in Morocco.

Treatment of Mange in Dromedaries by Tarry Extract of Colocynthis (L. Musso).—The inhabitants of the Sahara smear their dromedaries with a "tar" distilled from the seeds of the Colocynthis plant, one application of which, they claim, gives excellent results, while two are sufficient to effect a cure in the worst cases. It is prepared in a primitive form of still, 15 litres of seed giving about 4 litres of "tar." The product consists of three layers, the topmost and principal of which is a black, evil-smelling liquid of the consistency of coal tar, soluble in chloroform at 1/20, but only partly soluble in alcohol or ether. It shows an acidity of 0·840 gr. per cent. (acetic acid). The acidity of the second layer, which is watery and may also possess some therapeutic power, is greater (1·020 gr. per cent.).

On a Case of Intestinal Bilharziosis showing Schistosomum hæmatobium, and the Geographical Distribution of the Disease in the Belgian Congo and East Africa (E. Lagrange).—A child of 8, having come from the Belgian Congo to Dodoma in the district of Ugogo, formerly German East Africa, showed symptoms of acute dysentery with eggs of *S. hæmatobium* in the stools. Free miracidia were seen in nearly all the fresh smears, a fact which does not occur with *S. mansoni*. In the Congo basin rectal bilharziosis is known in the districts of Tanganyka and Upper Katanga, but only in the form due to *S. mansoni*. To reach Dodma (a sandy plain, the inhabitants of which are provided with water during the dry season by wagons obtaining supplies from deep wells some miles away) the child passed through Tanganyka. Whether she was infected in the Belgian Congo, in passing through Tanganyka, or on arriving at Dodoma, this is the first time *S. hæmatobium* has been observed within the boundary line formed by Uganda in the north, Zanzibar in the east, and Nyassa in the south.

On the Evolution of Anaplasma in the Blood of Bovidæ (J. Lignières).—In order to study the development of *Anaplasma argentinum* blood was taken from the jugular vein of bovidæ suffering from marked anaplasmosis, defibrinated, placed in sterilized tubes, and incubated at 37°. Specimens of the fresh blood, stained with Laveran or Giemsa, showed numerous normal parasites, and also some very small forms measuring scarcely a third of the diameter of classic *Anaplasma*. The same blood after twenty-four hours' incubation showed the formation within the *Anaplasma* of rounded granules, highly and uniformly coloured, usually in fours; these freed themselves later, and appeared identical with the anaplasmatic forms seen in the fresh red blood cells. During the next few days the phenomenon rapidly became general; it was also observed to take place at laboratory temperature, though the process was then a slower one.

Anopheles Centres in the Ardennes (G. Péju).—In this part of France the Culex family is less numerous and various than in the Argonne, and is represented chiefly by species harmless to man. There are, however, many Anopheles, distributed over wide areas, and these, no doubt, were responsible for the malarial centres which were active in the district during the war. Some of the latter would appear to have been already in existence in the not long distant past, and at one point the larval forms of an infection in regression seem to have been preserved. Apart from removing malarial patients from the mosquito-inhabited areas, the danger for the future is not great enough to necessitate prophylactic measures.

Correspondence.

To the Editor of the JOURNAL OF TROPICAL MEDICINE AND HYGIENE.

SIR,—In the Journal for February 16 there appeared a paper by Dr. Chalmers and Major Kamar on *Toxoplasma pyrogenes* from the Sudan. This paper also gave an account of non-malarial and non-typhoidal febrile ailments occurring in the Burun district of the Anglo-Egyptian Sudan. As I have no personal experience of the organism termed by Castellani *Toxoplasma pyrogenes* and have not seen the splenic film which the authors mention, I am unable to give any opinion as regards the protozoon, but I would suggest that the cases of fever which are described may be examples of kala-azar. The symptoms detailed are quite compatible with those which are characteristic of this disease and we know that kala-azar must exist in the Burun country. Dr. A. MacTier Pirrie, who carried out some anthropological work for the Wellcome Tropical Research Laboratories in 1906, undoubtedly acquired in the Burun country the leishmania infection to which, unhappily, he subsequently fell a victim. Hence, despite the presence of *Toxoplasma pyrogenes* in the splenic film from one of the cases, I think it would be well not to exclude the possibility of this febrile complaint being kala-azar.

I am, yours faithfully,

ANDREW BALFOUR.

Medical News.

AT the annual meeting of the Society of Tropical Medicine of France (Société de Pathologie Exotique), held on December 10, 1919, Sir William Leishman and Prof. Aldo Castellani were elected "Membres honoraires"; Sir Leonard Rogers, Dr. C. Donovan, Dr. Simon Flexner, Dr. C. Chagas, Dr. A. Broden and Dr. T. Rodhain "Membres associés"; Dr. R. Archibald, Dr. F. W. Craig, and Dr. H. B. Ransom "Membres correspondants."

Original Communications.

FOUR INTERESTING CASES OF BILHARZIA DISEASE TREATED BY TARTAR EMETIC.

By F. G. Cawston, M.D.Cantab.

The following cases of bilharzia disease treated by tartar emetic are of special interest, because two of them were cured by comparatively small doses of the drug. One showed an idiosyncrasy which interrupted the treatment for a while, whilst the other was suffering from chronic albuminuria following acute Bright's disease when the treatment commenced.

On November 15, Mr. C., aged 21, reported that he had noticed slight hæmorrhage at the end of micturition for the last eighteen months. There was no tenderness or pain, and he attributed his condition to bathing in the Umbilo river. Five years ago he had suffered from the same symptoms, but had apparently recovered. The urine contained numerous spine-pointed eggs. A quarter of a grain of tartar emetic was given intravenously, and the dose gradually increased to 1½ gr. If given regularly every second or third day, 1½ gr. would appear to be the maximum dose necessary to effect a cure. He took 10¼ gr. in all without the slightest general effect. On November 27 the urine was much clearer, and all trace of eggs or cells had disappeared from the urine by December 6, three weeks from the time the course of injections commenced. On December 22 the urine was still free from cells and eggs, and on January 10 the patient reported that his water was remaining clear. On January 14 his brother reported that he had noticed slight hæmaturia and pain in the bladder for the last week. Six years ago, when 14, he had contracted bilharzia disease from the Umbilo river, but the symptoms had disappeared during an attack of pneumonia whilst at Potchefstroom in 1917. As the urine contained the typical spine-pointed eggs, ¼ gr. tartar emetic was given intravenously. The next day he received ¾ gr., and on the third day a full grain, without the slightest constitutional disturbance. He stated that the pain had already disappeared, and that the burning sensation whilst passing his water had all gone. On January 19 his urine was free from eggs, but he was given 1¼ gr. tartar emetic and 1¼ gr. on January 21. On January 29 the urine was still free from eggs, and he was given his last injection of 1 gr. tartar emetic, as he considered further treatment unnecessary. He had received a total of only 5⅜ gr. of tartar emetic.

On December 12, Mr. S. reported that he had contracted bilharzia disease before the war from the Umbilo river, or possibly from the Palmiet lake or Umhlatazana. I have found *Physopsis africana* in each of these places.

There was no tenderness, but the patient complained of occasional backache and pain in the bladder, and had been shot through the right lung and suffered from pericarditis whilst on active service. The urine contained numerous spine-pointed eggs.

A ½ gr. of tartar emetic was injected intravenously, and produced burning sensation in the bones of the arm and some general discomfort; but the patient was prepared for a second injection next day.

On this occasion ¾ gr. tartar emetic produced pins and needles all over the body for about half an hour and general malaise for the rest of the day. On December 15 the urine contained numerous eggs, nearly all of which were dead and one already blackened; on the 17th one living egg was detected in the centrifugalized deposit.

In view of the severe reaction to tartar emetic, 1 c.c. collosol antimonium was injected intramuscularly. This also produced general discomfort, lasting twenty-four hours. On this occasion many living eggs were found in the urine, and two miracidia were seen swimming about in the undiluted urine, a not uncommon occurrence at this stage of the treatment. Twenty-five minims of collosol antimonium on December 27 caused somewhat less general discomfort. On the 29th many dead eggs were detected in the urine. The following night tartar emetic 2 gr. in morphine tartrate ½ gr. was given as a rectal suppository, but the patient complained that this caused too much discomfort to be repeated more than once.

Living eggs were present on January 6, and tartar emetic ¼ gr. was given on January 8. This dose was gradually increased to 1½ gr. on January 23 without any appreciable disconfort Eggs were present in the urine on January 14 and 19, but the specimens were clearer. After the intravenous injection on January 23 the patient went down town in a tram whilst perspiring freely, and was confined to bed for a week with sore throat, hoarse cough, rise in temperature, and general aches and pains. On January 30 he had a sudden collapse, requiring a hypodermic injection of strychnine. No eggs were detected in a centrifugalized specimen of the urine on January 27 and February 4, and the urine has remained clear since. This patient received a total of 8⅞ gr. of tartar emetic intravenously, 4 gr. by the bowel, and 25 minims and 1 c.c. collosol antimonium intravenously.

Influenza symptoms are not at all uncommon in patients undergoing treatment by tartar emetic, and may be associated with the death of the bilharzia parasites and the escape of their debris in the urine, or may be connected with the accumulation of antimony in the system.

On January 12, Mr. R. reported that he had suffered from bilharzia disease for five years, causing frequency of micturition, slight hæmaturia, and right-sided renal colic for two and a half years, which had been treated by rectal suppositories of morphia. He had suffered from albuminuria as a child. Twelve years ago he was in bed for 100 days with acute Bright's disease and bad œdema of the legs, abdomen and neck, the urine being solid with albumin. The œdema recurred ten years ago and lasted about two months He had had no re-

currence of œdema, but occasionally tested his own urine for albumin, which he found always present. Two years ago Dr. Strapp of Maritzburg treated him for albumin and casts. X-ray examination at that time showed no calculus. He was uncertain whether he could stand the tartar emetic treatment; but, in view of the presence of numerous spine-pointed eggs in his urine, the risk seemed to be justifiable with caution, and he was given ¼ gr. intravenously. On January 16 the dose had been increased to 1 gr. This caused some difficulty in breathing for a few minutes only. The urine contained much albumin and numerous eggs. One and a half grains on January 20 gave rise to temporary collapse, but no restorative was needed except a sip of cold water. On the 22nd 1 gr. was injected without bad effect. The urine contained dead ova, and no blood had been noticed since the 19th, the last occasion on which it was seen. On the 26th there was much less albumin in the clear urine, which contained a few cells and eggs. On the 27th black eggs were seen. On the 30th there was no trace of albumin and two glassy eggs were seen. On February 2 and 4 the urine was still clear and only dead eggs detected. The patient was feeling much better for the treatment, and had received a total of 11½ gr. tartar emetic intravenously.

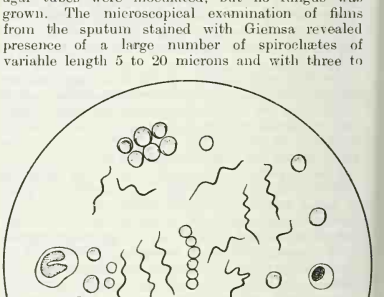
NOTES ON A CASE OF "CASTELLANI'S BRONCHITIS."

By I. Iacono, M.D.

Captain, Italian Naval Medical Service; Assistant Physician, Royal University of Naples.

Bronchospirochætosis is very little known in Italy, and very little attention has been paid to it owing to the belief that it is purely a tropical condition. The researches carried out by Lurie and Castellani in the Balkans, by Galli Valerio in Switzerland, by Violle and others in France, and by Broughton-Alcock in Northern Italy, have clearly shown, however, that the malady is a cosmopolitan one. I began looking for cases of bronchospirochætosis in 1917 at Taranto and other places in South Italy, but with negative results. Recently, however, I have seen a typical case (acute type), in consultation at Zara, on the Dalmation coast.

Miss E. B. No previous disease of importance. Present illness began eleven days before I saw her, with general malaise, rheumatoid pains all over the body and dry cough. The fever remained high and continued for several days, then it dropped in the morning and took a serotine type. Rather suspicious subcrepitant râles were found on the physical examination of the chest in the left apex, and this, together with the serotine fever and sputum tinged with blood, led the family doctor to suspect tuberculosis of the lungs. When I was called in the patient was very pale and feeling very weak; at the examination of the chest no zones of dullness were found. Moist and dry râles present all over, but no crepitant ones. Pulse 90, pressure rather high. Heart normal. As regards the abdominal organs the spleen was not enlarged, liver just palpable. Urine contained a trace of albumin, and there was a slight increase in the phosphates and indican. Blood: red blood corpuscles, 4,000,000 per cm.; leucocytes, 9,000; hæmoglobin, 70 (Fleish). As regards the leucocytic formula, there was an increase in the eosinophiles and lymphocytes. No malaria parasites and no spirochætes were found. Examination of sputum for tubercle bacilli negative. Several glucose-agar tubes were inoculated, but no fungus was grown. The microscopical examination of films from the sputum stained with Giemsa revealed presence of a large number of spirochætes of variable length 5 to 20 microns and with three to



six undulations In fresh preparations examined with the ultra-microscope numerous very motile spirochætes were seen. I made a diagnosis of broncho-spirochætosis and prescribed the mixture recommended by Castellani, the formula of which is:—

Tartar emetic	...	...	gr. ii
Syr. tolu ...	..	...	ʒi
Aq. chlorof. ...	...	...	ad ʒiii

One teaspoonful in water every two hours.

This treatment had a very satisfactory effect, as within three days the serotine fever stopped, and after less than three weeks all the bronchial symptoms disappeared, and the patient's general condition of health became quite good. I believe that Castellani's bronchospirochætosis is of more frequent occurrence in Southern Europe than is generally assumed, and I propose to continue my researches on the subject.

References.

Broughton-Alcock: "A Case of Bronchospirohætosis," Journal of Tropical Medicine and Hygiene, December 1, 1919.

Violle: "Hæmorrhagic Bronchitis" (Castellani's Bronchopulmonary Spirochætosis), *Lancet*, December 7, 1918.

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THE JOURNAL OF

Tropical Medicine and Hygiene

MARCH 15, 1920.

TOBACCO SMOKERS CLASSIFIED.

THE number of the male population over the age of 16 that use tobacco in Britain may be put down at 90 per cent. The proportion here stated may be said to be too low by some and too high by others. There are no accurate statistics available, and one has to frame a number from observations made amongst one's acquaintances and neighbours. Long before 16 years of age many boys smoke, but amongst these much is done from "bravado" or "showing off," and in every case it is done surreptitiously.

The writer, in filling in schedules during examination as to whether candidates are fit or otherwise for service abroad, finds it difficult to state whether a man is a "light" smoker or a "heavy" smoker. What is a light smoker and what a heavy smoker may be stated in general terms, but we have no standard set or scale formulated whereby a more or less accurate conclusion can be come to.

CIGARETTES.

Take cigarettes first. Is it possible to say what constitutes a moderate or an immoderate smoker? In the first place, it no doubt depends upon the quality and strength of the tobacco used. The lady who was stated in the papers last week to have got amblyopia from smoking cigarettes she made herself from shag tobacco represents one end of the scale and mild Turkish or Virginia the other. Neglecting for the moment the kind of tobacco used, we can fall back upon the number consumed as a gauge of indulgence with a certain degree of reliability. On this basis cigarette smokers may be classified as follows:—

When smoking Cigarettes only.

(1) Occasional smokers	0 to 1 daily.
(2) Light smokers ...	3 ,, 5 ,,
(3) Very moderate ...	5 ,, 10 ,,
(4) Moderate	10 ,, 18 ,,
(5) Heavy	18 ,, 30 ,,
(6) Excessive	30 and over.

The period at which heavy cigarette smoking is indulged in is mostly between 20 and 30 years of age.

A young man of, say, 21 years of age, who smokes twenty cigarettes daily, usually regards himself as "a very moderate smoker." He judges the amount he consumes by comparing himself with his neighbours. Few would feel justified, however, in considering this very moderate smoking.

Many make a point of never inhaling, and consider themselves as most abstemious by not doing so.

PIPE SMOKING.

In the tropical countries few men smoke pipes. If they do it is seldom they use pipes only; but use cigarettes or a cigar as well. Some use all three—cigarettes, pipes, and cigars in turn. Taking an average-sized pipe, and neglecting the quality of the tobacco and when a pipe only is smoked, pipe smokers may be classified as follows:—

(1) Occasional smokers, not even a daily pipe.

(2) Light smokers consume not more than ¼ oz., i.e., three pipes a day.

(3) Very moderate smokers, four pipes a day.

(4) Moderate smokers, ½ oz., i.e., six pipes daily.

(5) Heavy smokers, ¾ oz., i.e., nine pipes a day.
(6) Excessive smokers, 1 oz., i.e., twelve pipes daily.

Cigars.

In size, strength, and quality cigars vary even more widely than in the case of pipe tobacco.

Cheroots are yet another class of smoke which range from the light Manila to the heavy Burmah.

As an example of excessive smoking of cheroots, the writer has recorded elsewhere the case of a man whose "allowance" whilst doing out-of-door (surveying) work in Mauritius was not less than a box of 100 Manila cheroots daily. Not that he smoked all of these—he gave some away. He always brought home a few in the box, and he seldom smoked a cheroot more than half-way down. His own allowance he calculated to be some seventy-five daily. He began at 5 a.m., and except during meals never was without a cheroot in his mouth until bedtime.

Taking a cigar of moderate size and strength we find:—

1. Occasional smokers	...	0-1 daily.
2. Light smokers ...	...	2 ,,
3. Very moderate	...	3 ,,
4. Moderate ...	...	4 ,,
5. Heavy	...	8 ,,
6. Excessive ...	...	10 and over.

Time of Day.

Early morning smoking is universally condemned, and rightly, too. It means smoking when the temperature of the body is low, the strength owing to the long fast of night at its feeblest, and the heart muscle readily affected. To those who take a fair meal before starting upon an early journey, smoking subsequently to the meal, however early, need have no really detrimental effect; and even for those who have a breakfast cupful (not a teacupful only) of tea with a fair quantity of bread and butter or biscuits, a pipe or cigarette is easily tolerated. To the early smoker, however, who takes nothing until breakfast, the effect is fraught with danger for the moment, and, if the habit is persisted in, many constitutional evils arise. One naval surgeon of the writer's acquaintance attributed, rightly or wrongly, his "progressive muscular atrophy" to the evil habit of pre-breakfast smoking for many years.

After a meal is the best time to smoke; the worst when fatigue is great, or when one is exhausted owing to a long interval between meals.

The whole question of smoking in hot countries is from time to time dealt with by Government authorities and doctors. It is not so long ago since it was officially announced by order in West Africa that smoking was to be reduced to a minimum by all employees. The lethargy induced, the detriment to the heart muscle and to the nervous system generally was so lowering to the whole system that smoking was recommended—nay, ordered—to be reduced to a minimum. This meant a cigar, a pipe, or some two or three cigarettes in the evening only. Some attribute the drinking habit to the inevitably lowered tone induced by smoking. Extremists would condemn, even for the tropics, all alcohol and tobacco, and would regard the non-smoker and total abstainer as one leading the hygienic life, best calculated to resist the trying exigencies of a tropical climate. Extremists in every phase of public life have their uses, but the very rigidity of their teaching thwarts the good they might do towards betterment, and temperance in all things personal as well as political will continue to hold the field for all time.

Effects of Smoking on the System.

As regards the evil effects of excessive smoking and its permanent effect upon the heart and the economy generally, the completion of the story of the man in Mauritius mentioned above is worthy of recording. A Government official, this gentleman, whilst an elderly man, came from Mauritius to Hong-Kong and took up work there. After a few years in Hong-Kong he got an attack of malaria. (He had malaria in Mauritius severely.) He was under the care of Dr William Hartigan, who summoned the writer. The patient had had a temperature of 110° F., but Dr. Hartigan said that it must have been a faulty thermometer, as the patient was better now. That it was not a faulty observation was evident, for when the writer saw the patient he was perspiring, and regaining consciousness, &c., but his temperature was still at 108° F. He gradually recovered, remaining for many years afterwards in the Government service. Few men with a hyperpyrexia so extreme ever recover, and yet here was the excessive smoker with an "allowance of 100 cheroots a day" who did so. Whilst in Hong-Kong the patient had reduced his smoking to about twelve a day, and continued to adhere to that number through all his service time. Nicotine is believed to disappear from the body in three days after smoking is left off. Its legacy may be an enfeebled digestion, but bearing in mind the story just told its organic effects may be insignificant.

Out-of-door Smoking.

It will be observed that the excessive smokers referred to above—the naval surgeon and the civil servant—lived an out-of-door life, and it is well known that out-of-door smoking and indoor smoking present totally different conditions. One can smoke with impunity three times as much in the open whilst driving or riding, as when working at a desk, and no bad effects ensue; but if the smoker is walking or cycling the rate becomes slower, the vigour is lowered, and the amount of ground covered markedly lessened.

The writer sees no reason to alter the conclusions come to in the earlier part of this article, but critics will say he should not have mentioned the case of the Mauritius smoker. Not so; he would remind his readers that this excessive smoker had

lost the power of resisting disease, that when he got fever his temperature went to 110° F. Few men are known to have recovered from so high a temperature; he was snatched from his grave by the skill of his physician, and had he followed the rules enunciated he would have never been in so terrible a predicament.

SMOKING IN OFFICES.

Smoking during office hours is allowed in some offices all day, in some it is allowed after a certain hour of the day, and in others it is forbidden. If the head of the firm is a great smoker he usually allows his juniors to smoke; in some offices the heads of departments only are allowed to smoke; and in some no one smokes during office hours. It will be observed that in offices where smoking is prohibited the work is got through more smartly and quickly, and that in offices where smoking is allowed the time taken to cover the work is longer, for nicotine slows the heart's action, renders the brain more sluggish and listless. Young hearts are affected more readily than those of more elderly men; the young men under 27 years of age cannot do when smoking as much as a man of 47 can do, so that the seniors, although unaffected themselves, set a bad example to their subordinate staff, and must not be surprised if these juniors fail in their smartness, and if there are continually complaints of "slackness" amongst them, for their hearts are more readily affected by tobacco.

The question of "compound" smoking—that is to say, cigarettes and pipes, or cigarettes and cigars, or ringing the changes on all three—is less detrimental than when only one kind of smoke is indulged, just as the man who varies his drinks is less likely to become a drunkard than the man who sticks to one form of liquor.

Annotations.

Ulcus Tropicum of the Genitals in Cyrenaica (A. Mei, *Giornale Ital. Malat. Veneree e dclla Pelle*, 1919, p. 29).—The author gives a detailed description of four cases in which *Ulcus tropicum* developed on the genital organs. In all the cases the lesion began as a rather hard granulomatous swelling, which later necrosed in the centre, an ulcer forming of large size. In the secretion *Spirosehaudinnia schaudinni* and fusiform bacilli were present in large numbers.

Trypanosomiasis americana (E. Tejera, *Annales dc la Direccion dc la Sanidad Nacional*, Caracas-Venezuela, Nos. 1-2, 1919).—A full historical and clinical account of American trypanosomiasis. The malady is caused by *Trypanosoma cruzi*, discovered, as is well known, by Chagas in Brazil in 1907. This trypanosome is principally characterized by the very large blepharoplast, and is transmitted in Brazil by *Conorhinus megistus*. The author agrees with Chagas in regard to the various clinical types of the malady. He has found the disease in Venezuela, where, according to the author's experiments, it is transmitted by *Rhodnius prolixus*.

Recent Work on Tropical Diseases (R. T. Hewlett, *Practitioner*, March, 1920).—In this interesting paper the author reviews recent work done on various tropical diseases. The failure of Bayliss' gum solution in *cholera* is recorded, and Kulne's method of treating the malady described. This method consists in giving massive doses of kaolin, and for the first eighteen hours neither food nor drink should be given except water. The author calls attention to the good results obtained in *yaws* by Guerrero, Domingo and Arguelles, using Castellani's mixture, the formula of which is tartar emetic, gr. i; sodium salicyl, gr. x; potass. iod., 3i; sodium bicarbonate, gr. xv; water, ad. 3i. This forms one dose, which is diluted to 4 oz. with water, and given three times daily to adults. *Bilharziosis:* Christopherson has cured a large number of cases by intravenous injections of tartar emetic, and his results have been generally confirmed. *Ankylostomiasis:* According to Wrench's researches, the best method of treatment is by chenopodium oil. One capsule containing 1 c.c. of the oil is given at 1 p.m., 2 p.m., and 3 p.m., and at 4.30 a.m. 6 drachms of castor oil is administered. Occasionally chenopodium induces vomiting, giddiness, and even symptoms of collapse.

Current Literature.

INDIAN MEDICAL GAZETTE.

Vol. LV, No. 2, February, 1920.

Typhus and Typhus-like Fevers in Birjand, East Persia (A. Sargood).—The author gives clinical details of temperature charts of nine cases of typhus and typhus-like fever which he has observed in East Persia.

Further Observations on Kala-azar (Saratsasi Kundu).—The author emphasizes the necessity of the practitioner being thoroughly well acquainted with all the varying symptoms of the disease, as the typical clinical features described in many text-books are not always seen. In the initial stage almost any type of fever may be seen, its resistance to quinine being its only noticeable peculiarity. In the intermediate stages the spleen and liver do not always show enlargement. The Leishman-Donovan bodies should always be searched for when chronic irregular fever, resistance to quinine, emaciation and weakness, and enlarged spleen and liver point to a diagnosis of

kala-azar. The intravenous injection of tartar emetic was found the most successful treatment in all stages of the disease.

Second Series of 25 Cases of Malaria treated by Hypodermic Injection of Cinchonine Bihydrochloride (D. S. Ollenbach).—Of the 25 cases here described 23 recovered; the remaining 2 cases were lost sight of, but probably recovered, as they did not return for more injections. The number of injections given varied from one to four, and the amount given from 3½ to 18½ gr.

Acute Necrotic Parotitis (R. C. McWatters).—In recording these two cases of a condition which he names Necrotic Parotitis, the author mentions that seven cases having exactly similar features were published by Mr. Zachary Cope (*Brit. Journ. of Surgery*, July, 1919), who met with them in Mesopotamia. In the author's two cases the parotids became swollen and painful, and on being opened by Hilton's method necrotic tissue and pus were found. It was noticeable that both these two cases and Mr. Cope's seven cases occurred during extremely hot weather, and mostly in men weakened by illness; some of the Mesopotamia cases were fatal. The author concludes that this acute inflammation of the parotid glands bears some relation to heat exposure, that it is dangerous to life, and that it requires very free incision.

Cobra Poisoning (K. K. Alandikar).—The patient in this case had been bitten by a cobra he had reared, and from which he had removed the fangs a month and a quarter previously. The bite was situated on the palm of the left hand at the root of the index finger. The patient was bitten at 11 a.m.; at midnight he complained of pain in the hand and shivering. Later on his condition became more serious, and at 5 a.m. he was unable to move the eyelids and eyeballs or to swallow. He remained in the same state for several hours, but at 11 a.m. the next day he began to show improvement, and by midnight he was very much better. The snake was found to possess fangs, though small ones; apparently they had grown again. The patient was first treated with injections of gold chloride; the author questions its benefit, and states that it set up a gangrene of the hand, which, however, was cured by incisions and by being kept in a hot permanganate bath. Later antivenene was given subcutaneously and intravenously.

JOURNAL OF THE ROYAL ARMY MEDICAL CORPS. Vol. XXXIV, No. 2, February, 1920.

An Anti-malaria Campaign in Palestine (E. P. Sewell and A. S. M. Macgregor).—An elaborate account of the preventive measures against malaria undertaken by the authors in Palestine in 1918. The campaign was based on the following measures, which were carried out as far as possible: (1) Drainage of marshes and canalization of streams; (2) oiling or closing of wells and cisterns; (3) avoidance by troops of the neighbourhood of rivers, marshes, and streams as far as tactical requirements would permit; (4) mosquito-proof huts; (5) use of repellant ointment and head-nets for men exposed on duty at night; (6) avoidance of villages by at least half a mile or removal of native population; (7) evacuation and thorough quininization of soldiers infected with malaria.

Larvicides (J. F. Mayne and W. R. Jackson).—The authors believe that one would get better and more lasting results by mixing the paraffin with the water in treating pools rather than by simply spraying it on the surface. They have obtained very good results with cresol.

Note on the Relative Proportions of Amœbic and Bacillary Dysentery among the Troops of the Egyptian Expeditionary Force (H. M. Woodcock).—The author admits, with most authorities, the great preponderance of bacillary dysentery in Egypt and Southern Palestine, but emphasizes the point that due importance should be given also to the amœbic type.

Pulmonary Manifestations of Malaria (A. W. Falconer).—The author has observed several cases of bronchitic and consolidation syndromes due to malaria. He gives some detailed clinical histories with temperature charts.

Porocephalus in a Hernial Sac (J. W. Tudor Thomas).—A West African negro soldier was operated on for right-sided inguinal hernia. On opening the sac a larva was found coiled up in the sac wall, and covered over by a thin transparent lining membrane. The specimen was submitted to Colonel Newman, who identified it as the larva of a porocephalus.

Abstracts.

SPREAD OF THE SPIROCHÆTE OF INFECTIOUS JAUNDICE.[1]

MODERN medicine has taught the importance of knowing the parasites of the animals that live in close contact with man. The louse, the flea, the mosquito and the rat are not merely disagreeable pests which disturb our comfort or damage our property; they are the often unsuspected carriers of harm—the hosts of invisible foes of mankind. Scarcely five years have elapsed since the Japanese investigator Inada and his colleagues discovered that *Spirochæta icterohæmorrhagica* is the cause of Weil's disease, to which the name "spirochætal jaundice" may now properly be applied. This discovery was made opportunely, as epidemic jaundice became prevalent among some of the troops of the allied nations early in the war. The rat was found to be a carrier of the parasite; and as the disease reported among soldiers of practically all nations engaged in combat was found most

[1] Abstracted from the *Journ. Amer. Med. Assoc.*, Feb. 7, 1920.

frequently at the front, the rat-infested environment permitted an interpretation of the probable etiologic factors.

Spirochætal jaundice is not confined to Japan or to the fields of Flanders. As might be expected, the rat in other parts of the world has given evidence of infestation with the spirochæte of this disease. Lyons, Marseilles, Barcelona, Tunis, Algiers and New York have already given scientific proofs of the same danger in their midst. London is the latest city to furnish new evidence of the widespread occurrence of the parasite in wild rats. Of a hundred of these rodents, at least 4 per cent. were infected with the spirochæte of jaundice.

The world-wide distribution of reservoirs of this spirochætal disease must now be recognized. This makes it more imperative than ever to learn the mode of transmission to man. Although spirochætal jaundice in man has been caused by rat-bite, direct infection in this manner can be excluded in practically all instances, in contrast with what happens in the genesis of rat-bite fever due to *Spirochæta morsus-muris*. Although it is not quite certain whether the spirochæte of jaundice has been identified in the intestinal contents of the healthy rat, it has been found in the fæces of infected guinea-pigs; and its presence in the fæces in cases of spirochætal jaundice in man may be assumed. The presence of the spirochætes in considerable numbers in the urine of rat-carriers is quite sufficient to ensure a wide distribution in rat-infested areas. The possible rôle of insects as accessory or alternative factors in spreading infection cannot be excluded. However, as Noguchi has recorded a case in which the urine was actively pathogenic as late as four weeks after the onset of the disease, the convalescent stage of which commences usually at about the fourteenth day, the urine of human patients must still be looked on as a source of possible danger.

MILK PRODUCED IN SOUTHERN CHINA.[1]

By C. O. Levine.

Canton Christian College.

Three classes of milk animals have been studied: European cattle, the native water buffalo (known in the Philippine Islands as carabao), and the native humped cattle. The work has been done chiefly in the vicinities of Canton and Hong-Kong, the only regions in Kwangtung (which is the southernmost province in China) where dairying has as yet developed into an industry of any extent.

European cows, or foreign cows, as the Chinese call them, are the most popular for dairy purposes. In the dairies of Canton and Hong-Kong, which utilize approximately 1,600 cows, about 1,200 are European. The European cows have been imported from Australia, America, and England, or are the offspring of such imported cows. In the various dairies may be found Shorthorns, Holsteins, Ayrshires, Guernseys, Jerseys, and crosses among these breeds and with the native humped cows. There are a few pure-bred cows. The Shorthorns, which are the commonest, are chiefly of the white, hornless variety that have been imported from Australia.

European cows are never allowed to graze because of the presence everywhere in the grass of the fever tick. They readily contract fever when exposed to it, and the disease usually proves fatal. However, European cattle born in Southern China readily become immune to the fever, as they do in Texas, where fever is common. In spite of the greater labour and risk experienced in keeping European cows, they are preferred to the native cows because of the larger amount of milk given and their efficiency, as compared with native cattle, in converting feed into milk.

The Chinese in South China call the native cow wong ngan, "yellow cow." This bovine is a variety of the humped species of cattle (*Bos indicus*) common in the Orient. The hump is much less pronounced than it is in most breeds of Indian cattle. In the males the hump is usually 6 to 8 in. high above the shouders. It is much smaller in the females than in the males. The dewlap is large, but is not developed to the degree common in Indian cattle. In colour, these native yellow cattle are similar to the Jerseys. They vary from yellow-red to brown-black. Many are brindle. There are no white and very few spotted individuals. The tongue, nostrils, and teats are black. The cream-coloured ring above the nostrils in the Jersey is also a characteristic of these cows. Males weigh from 800 to 1,000 lb. (about 362 to 454 kilograms). Mature females weigh from 600 to 800 lb. (about 272 to 362 kilograms). Their milk is considerably richer in fat than is that of any European breed, though not so rich as is the buffalo milk. The amount of milk given is usually about the same as that given by the buffalo cows or a little less. They have a full deep quarter and a deep layer of meat on the loin and back. They are used chiefly for draft and beef purposes. They are gentle and much easier to handle than are the buffaloes. Very few are milked.

Milk Analyses.

In making the fat analyses of milk a Babcock fat-testing outfit was used. The proteins were determined by the Kjeldahl method described by Hawk. The total solids were determined by evaporating a weighed sample of milk on a steam bath until the weight became constant. The ash was determined by heating the evaporated total solid over a gas flame until the weight became constant. The amount of sugar was found by subtracting the sum of the fat, ash, and proteids from the total solids. The percentage of each was found by dividing the weight of the final product by the weight of the sample of milk analysed.

[1] Abstracted from the *Philippine Journal of Science*, 1919, vol. xc, No. 1.

Table I.—Showing analyses of Canton buffalo's milk, European cow's milk in Canton, European cow's milk in America, and native yellow cow's milk:—

Constituent	Canton buffalo	European cow Canton	European cow America	Yellow cow
	Numbers give Percentages			
Fat	12·60	3·80	3·69	8·00
Proteins ...	6·04	3·23	3·53	—
Sugar	3·70	5·96	4·18	—
Ash	0·86	0·82	0·73	—
Water	76·80	86·20	87·17	—
Total Solids ...	23·20	13·90	12·25	—

All the samples of milk analysed were taken by me directly from the barn as each cow was milked; not from bottled milk that is sold to the public and is frequently diluted with water.

The analyses show that European cow's milk is practically the same as when produced in the countries from which the cows have come. With more analyses the slight differences in some of the constituents will probably prove to be still less. Sixty duplicate analyses of fat, or one hundred and twenty in all, from the milk of twelve cows, extending over a period of eighteen months, were made. Ten analyses were made for each of the remaining constituents.

The analyses of buffalo milk included 400 duplicate analyses for fat in a herd of fifty buffalo cows kept in the Canton Christian College dairy, including both individual and herd tests of five dairies in Canton. Compound analyses of both morning and afternoon milk were also made. The average was found to be 12·60 per cent. fat. The lowest test was 9·80 per cent. The lowest average for a lactation period of all cows was 9·65 per cent. The highest average was 15·60 per cent. The percentages of constituents in the buffalo milk other than fat represent averages of ten analyses. The proteins varied from 5·60 to 6·10, with an average of 6·04 per cent. Sugar was low, varying from 3·51 to 3·75, with an average of 3·70 per cent. The average for ash was 0·86, varying from 0·71 to 0·99 per cent. The total solids averaged 23·20, varying from 21·00 to 25·20 per cent.

The milk of the native yellow cow is rich in fat, averaging about 8 per cent. No analysis has been made of this milk for constituents other than fat.

In all regions where buffalo milk has been analysed it has been found to contain a great deal more fat than does European cow's milk. However, in no region from which the analysis of milk has been reported does the buffalo milk contain as much fat as in southern China.

Buffalo milk is pure white with absolutely no tint of yellow. Cream and butter made from it are rather oily and have but a faint tint of yellow. By mixing European cow's cream with the buffalo cream and using vegetable butter colour the colour and the texture can be greatly improved.

Like most milk, buffalo milk has little or no odour. The strong odour often found associated with it is due to foreign substances, such as hair, or flakes of dead skin, that fall into the milk when proper sanitary precautions are not used in milking. When such foreign substances get into the milk, the bacteria that they introduce multiply very rapidly and produce gases with unpleasant odours.

In the College dairy both European and buffalo cows are kept. Buffalo milk is much preferred, because of its richness, by both foreigners (American and European) and Chinese. In modifying milk for infants requiring modified milk, the college physicians prefer buffalo milk to European cow's milk because of the ease with which it lends itself to modification. The usual formula for modification is 100 grm. of buffalo milk, 18 grm. of sugar, and enough boiled distilled water to make 300 grm. This makes the percentages of fat, proteins, sugar, and ash about right for infants, as when thus modified the milk compares well with human milk. For children of 3 years or more, the milk is usually simply thinned by adding an equal amount of water.

Review.

Electrical Treatment. By Wilfred Harris, M.B. 3rd Edition. 1919. Pp. 354 + x. London: Cassell and Co. 9s. net.

A fuller title might be: Electricity—what it is, when and how to use it. Much more than the title indicates is contained in the book, as all conditions where electricity is of use are mentioned. The methods of using are fully described, both for diagnosis and for curative purposes, marked care being devoted to avoid pain or accident which patients so much dread.

Muscular dystrophies and their diagnosis is a notable feature; care is taken to avoid confusing readers by meaningless names and terms.

The theory of electricity is explained, and, except X-rays, its technique, in a way that assists those commencing the study of the physics of electricity, of both anatomy and of physiology of the nervous system, and to enable them to understand normal and abnormal function.

The book is of use to beginners in clinical neurology and to those anxious to revise their methods of diagnosis and treatment. The author shows the evils resulting from the teaching of electricity to students by those who refuse to inform themselves of the needs of medicine; so doctors neglect the practical use of this therapeutic agent, and patients resort to the camp-followers of medicine.

The paper "Some Observations on *Vibriothrix xylanica*," by Dr. L. Anigstein, published in this journal on January 1, 1920, was previously communicated by the author to the Cracow Academy of Science.

Original Communications.

OBSERVATIONS ON THE LARVÆ-DESTROYING ACTION OF SMALL FISH IN THE MALAY ARCHIPELAGO.

(From the Institute of Tropical Hygiene, Amsterdam).

By N. H. SWELLENGREBEL, Ph.D,

AND

J. M. H. SWELLENGREBEL-DE-GRAAF.

In the Malay Archipelago we find several species of fish, which as adults or as young forms may be induced to eat larvæ of Anopheles. Three of them we found to be especially voracious, viz.: *Haplochilus panchax* and the young of *Ophiocephalus striatus* and *Dangila cuvieri*. The first we found in salt-water fishponds along Java's north coast and also in the wet rice fields in the interior, the second and third in the fresh-water fishponds in the interior of Sumatra.

Both species occur in great numbers, together with still greater numbers of larvæ. But this may be due to the fact of the ponds being, as a rule, overgrown with vegetation, which is said to protect the larvæ against the attack of fish.

(1) *Experiments with H. panchax.*

This small fish is extremely voracious (see Table I). Two specimens may eat 100 larvæ in half an hour's time. We examined the gut of twenty-six specimens caught in fishponds containing abundant larvæ of *M. rossii*. After our experiments we were much surprised to find remnants of larvæ in only two of them. Of the others, fifteen contained animal remains (seven, larvæ of a water-beetle and water-bugs, both active destroyers of Anopheline larvæ, which shows that the action of *H. panchax* may be directed in several ways). The other nine only contained vegetable matter.

This discrepancy induced us to observe the behaviour of *H. panchax* under natural conditions. We found these especially favourable in a broad salt-water ditch, partly overgrown with algæ, (*Enteromorpha*).

The larvæ (a mixture of *M. rossii* and *Culex micro-annulatus*) were so numerous as to form a greyish seum on the water. They formed definite agglomerations, sometimes between the algæ, but often free, with a clump of algæ as a centre, or adhering to the stone wall, which formed one of the banks. This agglomeration around a small piece of algæ was very marked when bringing in a batch of larvæ in a portion of water almost free from algæ. The larvæ did not flee among the neighbouring thick algal growth, but gradually assembled around the floating piece.

From time to time the larval "colonies" showed signs of "swarming," leaving their agglomerated position and spreading in all directions. When a fish approaches, or any other large living thing, or when a shadow falls on the water, they instantly dive down and then reassemble in their colony. (This applies to *M. rossii*; *M. sinensis* and *barbirostris* are not in the habit of diving down or of being frightened by shadows.)

Among these algæ and larvæ we observed 106 *H. panchax*. There appeared not to be the least difficulty in their moving about under the algæ. *M. rossii* is in the habit of constantly diving down and so it is not easy to understand how the algæ can protect them against the attack of the fish. Still it is impossible to observe what takes place under the algal cover and so we had to confine our observations to the larvæ moving about in places where observation was not impeded by thick algal growth.

At first larvæ there were scarce and we had to put in 1,200 larvæ in three batches of 400, which gradually formed new colonies around small patches of weed. During the first minutes *H. panchax*, especially the young ones, seemed to be attracted by the newcomers and twice we observed a larva to be swallowed, but soon the fishes became accustomed to it and took no more notice of the new state of affairs. We repeatedly observed a Haplochilus almost to touch with its nose a larva, without doing it any harm.

Later on free colonies (i.e., not surrounded by the algal covering) became more numerous, but the fishes always passed them without molesting them in any way. This is not because they cannot reach them: algæ are scarce and the water is not too shallow, for the fish is seen diving under the colony. At the day's end the free colonies were seen to retire between the thick algal covering.

Not only did the fishes abstain from attacking the free colonies, but they even seemed to avoid them, and when they had to pass under or through them they took a start and did so at an accelerated pace, only resuming their habitual celerity, after having left the colony behind them. This peculiar habit we repeatedly observed.

In a neighbouring pond the number of larvæ was much smaller. They were only to be found within the thick of the algæ; *H. panchax* was swarming under and around them. In the portion of the water free from algæ, we put a few hundreds of larvæ. Twenty-nine small specimens of Haplochilus were attracted by them and chased them from place to place, without, however, catching one of them. The larger specimens did not take any notice. As in the other collection of water, the larvæ gradually assembled to form colonies around small patches of algæ. In the Haplochili caught within this swarming multitude of larvæ, not a single one was found containing Anopheline larvæ in its stomach, the only animal remains being *Daphnia*, *Cyclops* and *Heliozoa*.

These observations apply to *H. panchax*, *M. rossii* and *M. ludlowi* in salt-water. In the fresh-water of the rice fields we observed different conditions. In the localities under observation, rice was planted in January, harvested in May and June, planted again in July and harvested in October-November. In December and January, before the planting of

TABLE I.—Experiments with Haplochilus and larvæ of *M. rossii*.

No.	Number of times the experiment was repeated	Number of fishes	Number of larvæ	Kind of glass in which the larvæ were kept	Special conditions (exc. vegetation)	Kind of vegetation present	Time of exposure of the larvæ to the attack of the fish	Period during which the larvæ were kept hungering	Number of larvæ devoured	Percentage of larvæ devoured		Remarks
										Total	Per one fish	
1	1 x	3	100	Glass jar of 10 litres	Indoors	None	2½ h.	Freshly captured	100	100	33	
2	1 x	2	100	,, ,,	,,	,,	36 m.	,,	99	99	49	
3	1 x	2	87	,, ,,	,,	,,	1 h. 20 m.	,,	87	100	50	

TABLE II.—Experiments with Ophiocephalus and larvæ of *M. ludlowi*, *M. barbirostris*, *M. sinensis*.

1	3 x	3	22	Glass jar of 3 litres	Kept indoors	None	3–5 h.	Freshly captured	19	86	29	
2 *a*	2 x	2	25	,, ,,	,, ,,	,,	2 h.	,,	21	84	42	
b	2 x	2	25	,, ,,	,, ,,	,,	,,	24 h.	24	96	48	
c	2 x	2	25	,, ,,	,, ,,	,,	,,	48 h.	25	100	50	
d	2 x	2	25	,, ,,	,, ,,	,,	,,	72 h.	25	100	50	
3 *a*	1 x	2	75	,, ,,	,, ,,	,,	1 h. 40 m.	Freshly captured	67	84	42	
b	1 x	2	75	,, ,,	Out of doors in the shade	,,		,,	74	98	49	
c	1 x	2	75	20-litre tin	,, ,,	,,		,,	51	68	34	
d	1 x	2	75	,, ,,	Out of doors in the sun, kept cool by running water	,,		,,	59	78	39	
e	1 x	2	75	,, ,,	Indoors in the dark	,,		,,	43	48	29	
4 *a*	3 x	2	25	,, ,,	Out of doors in the shade	Najas and Pistia	2½ h.	,,	8	32	16	Exp. 2 *a*, 3 *c* serve as control.
b	1 x	3	25	,, ,,	As in exp. 3 *d*	Najas	5 h.	,,	23	93	31	
c	1 x	3	25	,, ,,	,, ,,	Pistia	,,	,,	22	87	29	Exp. 3 *d* serves as control.
5 *a*	1 x	2	25	,, ,,	Out of doors in the shade	Najas, Pistia, fresh	2¾ h.	72 h.	15	60	30	Exp. 2 *d* serves as control.
b	1 x	2	25	,, ,,	,, ,,	Najas, Pistia, washed	3 h.	,,	22	88	44	

TABLE III.—Experiments with Dangila and the larvæ mentioned in table II.

1 *a*	2 x	3	22	Glass jar of 3 litres	Indoors	None	5 h.	Freshly captured	22	100	33
b	5 x	2	25		,,	,,	2½ h.	48 h.	22	88	44
2 *a*	1 x	3	25	20-litre tin	Out of doors in the shade	Najas	5½ h.	Freshly captured	7	28	9
b	1 x	3	25	,, ,,	,, ,,	Pistia	,,	,,	20	80	27
3 *a*	1 x	2	25	,, ,,	,, ,,	Najas, Pistia, fresh	3 h.	72 h.	6	24	12
b	1 x	2	25	,, ,,	,, ,,	Najas, Pistia, washed	,,	,,	20	80	40

the first crop, the paddy fields contained many small puddles without vegetation harbouring numerous larvæ of *M. vaga* (*indefinita*). After the paddy being planted, the water supply became more plentiful. With it *H. panchax* appeared and *M. vaga* disappeared, only to be left in small holes in the dykes separating the fields and in wayside puddles. Weeds were carefully eradicated. This is no longer possible when the paddy becomes mature; weeds (grass, algæ, *Monochoria*) begin to thrive now and with them larvæ. But these are of different species, no longer *M. vaga*, but *M. barbirostris, aconita, N. fuliginosus*. Even if vegetation is scarce, the recumbent stalks of the paddy plants in fields which have not been cut in time serve as such and this condition seems to be particularly favourable for the growth of the dangerous *M. aconita*. *H. panchax* is still present, but it does not check the larval growth, although the vegetation is never so thick as to prevent it from catching the larvæ. After paddy has been cut, weeds continue to grow in the fields which are left submerged, and larvæ (*barbirostris, fuliginosus, aconita* becoming scarce) remain numerous. The ploughing commences and with it the vegetation and these larvæ disappear to be replaced by *M. vaga*. The latter remains numerous, till the fields are again freely submerged, although during the time of this second cultivation all sorts of weeds grow plentiful from the onset and *H. panchax* remains scarce.

Thus it seems that only between *M. vaga* and *H. panchax* there exists any direct relation. For the other species such a relation does not become apparent.

(2) *Experiments with Ophiocephalus striatus.*

Only the youngest stages (of 3-4½ cm.) were used, the older ones being not at all attracted by larvæ. Without vegetation this fish proved a rather good larva destroyer, although not so powerful as *H. panchax* (Table II, 1). Its destructive powers can be much raised by hunger (Table II, 2). The surroundings, and especially the dimensions of the vessel in which fish and larvæ are contained, exercise a great influence on the number of larvæ devoured (Table II, 3). The inhibitory influence of vegetation (*Najas, Pistia*) was slight when three fishes were present (Table II, 4 *b, c*) with two fishes only, it was appreciable (Table II, 4*a*) with *Najas* (submerged) and *Pistia* (floating and submerged) combined. With floating and submerged algæ (*Spirogyra, Cladophora*) no inhibitory result was to be obtained. Even when two fishes only were used results were slight if they were very hungry, but especially so if the vegetation had been freed of the adhering micro-flora and -fauna by previously washing it (Table II, 5, *a, b*).

We also observed Ophiocephalus in nature among an aquatic vegetation consisting of *Najas*, various algæ and rushes on the shores of an extensive lake. The fishes were very numerous and so were the larvæ (*M. ludlowi, M. sinensis, M. barbirostris*). The small fishes (hardly more than five times the length of a full-grown larva of *M. barbirostris*) were well able to creep through the small meshes of the entangled vegetation and did so too, but they never seriously tried to catch the larvæ.

(3) *Experiments with Dangila cuvieri.*

Similar experiments were performed with the young forms of *D. cuvieri*. Here again the older stages are no longer of any use. In the 3-litre glass jars its voracity was not below that of Ophiocephalus (Table III, 1), but vegetation much impaired it, especially the influence of *Najas* appeared to be inhibitory (Table III, 2). The difference between washed and unwashed vegetation was in this case much more marked than in Ophiocephalus experiments (Table III, 3).

(4) *Conclusions.*

Haplochilus panchax and, to a lesser extent, *Ophiocephalus striatus* and *Dangila cuvieri* are good larva destroyers when kept together with the larvæ, in vessels not containing any vegetation. When this is present it inhibits the action of the fishes to a greater or lesser extent, dependent on the number of the fishes and the degree of their appetite. This influence can be reduced by washing the vegetation before the beginning of the experiment, thereby diminishing the amount of micro-flora and -fauna adhering to it. From these observations we conclude that the protection afforded by the plants is not a mechanical one, but is caused by these plants sheltering numerous other eatables for the fishes, which in this way are deviated from the larvæ. This conclusion is corroborated by the results of observations on *H. panchax* and *O. striatus* in nature, where it appeared that these fishes, living together with Anopheline larvæ among aquatic vegetation, only rarely tried to catch these larvæ, although there was nothing tangible to prevent them doing so.

We would suggest that the close relation existing between aquatic vegetation, larvæ and fishes is to be explained by the fact that both the latter derive (directly or indirectly) their food from the former. Destruction of the vegetation is an antilarval operation, not because it exposes the larvæ to the attacks of the fishes, but because it deprives them of their food.

Regarding *H. panchax* these conclusions only hold for salt or brackish water; in rice fields the larva-destroying qualities were quite apparent, provided that vegetation was absent, at least in regard to *M. vaga*.

As a practical conclusion (which, of course, only holds for the fishes and larvæ under observation) we would state, that in salt-water not much good is to be expected from the action of fish. In fresh-water, and especially in rice fields, their beneficent activity becomes more marked and it may be taken advantage of in conjunction with other measures, viz.: (1) timely cutting of the rice (before the stalks go down); (2) letting off of the irrigation water as soon as it is no longer necessary.

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THE JOURNAL OF

Tropical Medicine and Hygiene

APRIL 1, 1920.

SPECIAL INDIAN SCIENCE CONGRESS NUMBER, 1919.[1]

THE *Indian Journal of Medical Research* which has just come to hand is a welcome addition to our library shelf. The facts, opinions and figures, remarkable in many ways, were duly noted at the time the Congress was held—namely, January, 1919—so that the information conveyed in this special number and official publication may be considered ancient literature, seeing how rapidly tropical investigation work proceeds nowadays. Yet the number before us can but impress the world, and the world of medicine more especially, with the magnificent work our medical brethren in India have and are accomplishing not only in the scientific field of research, but also in the practical sphere of the application of the discoveries these researches have brought to light.

We often hear it said the Indian Medical Service is not what it was. It certainly is not; it is not progressing backwards, however, as the above legend implies; far other is its course. It has left its old and unwholesome traditions far behind, and has reached a stage of accomplishment, of organization and proficiency in the world of science that sheds a lustre on the service as a whole, a service of which the whole Empire has good reason to be proud. The best of the old régime culminated and perished with the death of Sir Joseph Fayrer. He was the Napoleon of pre-research (or what we wrongly term pre-bacteriological) days. As Napoleon was the last exponent of war methods before the introduction of railways and steam power into the world, so Fayrer had as capable a brain and was endowed with a power of observation and organizing ability as keen and capable as any of our modern exponents of science, yet he lacked the means of doing as they have done, for the microscope was in its infancy as an exponent of pathology and research as it is known to-day and was unknown to Fayrer and those of his time.

The writer had the privilege of knowing Sir Joseph fairly intimately, and of all the memories of that great man none are more impressed on his mind than Fayrer's remark when Manson's researches and opinions on malaria came before the Royal Society and were gaining ground in the scientific world. When speaking on the matter, Fayrer remarked to the writer: "As soon attempt to keep back the wind by a five-barred gate as to prevent the great disease of malaria by the eradication of mosquitoes." He could not conceive how the "great disease of malaria," the most widespread, the most terrible, and the most incapacitating of all diseases, could be brought about by a humble insect. The thing to him was incapable of belief. Yet these older men laid the foundation for the future advance of science in India; they founded medical schools, they established modern hospitals, introduced physiological teaching on modern lines, and paved the way for the reception of modern research, although neither they nor anyone else understood the meaning of the term, nor could conceive where that was to lead them.

The gifted President of the Congress, Sir Leonard Rogers, in his presidential address, ascribes great

[1] Published by Thacker, Spink and Co., Calcutta.

credit to the late Sir Pardey Lukis when he was Director-General of the Indian Medical Service, and we can endorse the testimony. Sir Pardey Lukis recognized the capable men he had around him, and by his organizing ability placed facilities for investigation at their disposal. He early recognized the great asset Indian medicine had in Sir Leonard Rogers himself, the one man became the complement of the other, and together they have accomplished a great triumph. It is none other than the escape of medicine from official thraldom, and the freedom given and afforded by the wise men in authority in India at the present day. The writer well remembers the struggle in the case of Dr. N. C. Macnamara, I.M.S., referred to by Sir Leonard in his address. The writer was in Egypt in 1883 a member of the Cholera Commission sent out to that country during the great cholera outbreak. Koch and his assistants came out and found the cholera comma bacillus. Dr. Macnamara visited Egypt at that time whilst on his way to India. He had just been devoting his leave in England to the study of bacteriology, and was well equipped in methods of research and investigation. Had he reached India a few days earlier, the cholera bacillus would have been a British in place of a German discovery. He returned to India equipped at every point to deal with the investigation of the cause of cholera, but we learn from Sir Leonard what happened:—

"Having thus qualified himself for the task by long experience of the disease and technical knowledge, in February, 1883, he applied to the India Office for facilities for pursuing his investigation on his return to Calcutta, but received an absolute refusal to entertain his request. The same Government, however, within a year gave every possible facility to a German bacteriologist to investigate cholera in India, who had in the meantime discovered the comma bacillus in Egypt. I have in my possession Dr. Macnamara's own account of this sad episode, which reflects so little credit on Indian administration. I am glad to say he has lived to see German culture so competely exposed by the Great War that the recurrence of such a discreditable event seems scarcely possible in the future. This episode is, however, typical of the want of encouragement Indian Medical Service investigators met with up to two or three decades ago, which has now happily given place to a very different spirit."

Something of the same nature happened when Manson applied to get Ross "research leave" to carry out Manson's mosquito-malaria infection theory; but happily this was managed, to the great credit of the Indian authorities. How different is the atmosphere that pervades all civilized Governments to-day as regards modern medical research need not be enlarged upon. In India support has been phenomenal.

Sir Leonard dilates upon this as follows:—

"Bengal and Bihar have generously given me seven lakhs for the Calcutta School of Tropical Medicine, half of which has been expended on the Carmichael Hospital for tropical diseases, and the remainder will be used for medical research and the partial upkeep of the hospital under a governing body of medical experts. In addition, the Tea, Jute and Mining Associations are contributing Rs. 60,000 a year for the support of three additional workers to investigate on practical lines those diseases which affect the value of the labour forces. Bombay has always been noted for the liberality of her citizens, so I confidently appeal to this great city to do at least as much for my friend Colonel Liston's school here, which he has laboured so long and patiently to found in connection with the Parel laboratory.

"But I also desire to make a still wider appeal. The late Sir Pardey Lukis, one of the ablest and most far-seeing administrators the Indian Medical Service has ever produced, founded the Indian Research Fund Association, to which the Government of India give the large sum of five lakhs yearly. It was hoped that this annual grant would have been materially increased by liberal contributions from the Princes and noblemen whose territories will benefit equally with those under British rule from medical research, and the wealthy citizens of India, but I understand that this hope has been sadly disappointed, mainly no doubt owing to Indian philanthropy having been rightly diverted during the war into other channels. Now that the world-wide devastation and the destruction of irreplaceable human life has at length ceased, I should like to see the flow of money diverted to the noble object of saving life by means of a great extension of medical research, and I can conceive of no more fitting thank-offering for the delivery of the world from the greatest menace that has ever threatened modern civilization. What is wanted is an Indian Rockefeller to come forward with a crore or two of rupees, backed by large contributions from many others, to be devoted to the aid of genuine medical research all over India independently of race or position, under the control of a governing body, the chairman and a large majority of whom should be scientific experts. I feel confident that practical philanthropy of this nature, by diminishing suffering and disease, and giving better health to the masses, will be of more real benefit to India than any so-called boons which have ever been dreamt of. Legacies for such work will no doubt be welcomed by the Indian Research Fund Association at Simla, but those who give liberally during their lifetime will have the far greater satisfaction of seeing for themselves the seed they sow in faith bearing fruit abundantly. As example is better than precept I may mention that I am giving as much as the most liberal donors to the Calcutta School of Tropical Medicine, and hope to be able to do still more for medical research in the near future, so I am not asking others to do anything I am not willing to do myself to the limits of my power."

J. CANTLIE.

Annotations.

Action of Radium on Yeast (*Journal of Biological Chemistry*, Baltimore, October, 1919).—It is noted that exposure to the action of radium will partially inactivate growth-promoting factors in yeast. Sugiura and Benedict suggest that possibly the therapeutic effect of radium on neoplasms may be partly due to this power of destroying growth-promoting substances.

The Etiology and Treatment of Seborrhœic Eruptions (Barber and Semon, *Journal of the Royal Army Medical Corps*, September, 1919).—The authors have noted that the majority of patients with seborrhœic manifestations show a markedly increased alkaline tolerance, and that as soon as the urine is rendered alkaline the active inflammatory process ceases and the eruption rapidly clears. The following mixture is recommended:—

Sodii bicarb.	...	...	3i
Pot. cit. ...	...	...	gr. xxx
Calc. lact. ...	...	...	gr. v
Mag. carb.	...	...	gr. v
Aq. chlor. ad	...	...	3i

Three times daily before meals.

Externally a calamine liniment or a 2 per cent. bicarbonate solution will be found useful.

Rocky Mountain Spotted Fever (S. W. Wolbach, *Journ. Med. Research*, November).—Three definite morphologic types of the spotted fever parasite can be recognized: (1) An extranuclear bacillus-like form without chromatoid granules, relatively large and only present in ticks during the initial multiplication of the parasites; (2) a relatively small rod-shaped form with chromatoid granules, probably the same form seen within nuclei in sections of ticks, and rarely in smooth muscle cells in the blood-vessel of mammals; and (3) a relatively larger lanceolate paired form present in ticks and in the blood and lesions in mammals. This lanceolate form is characterized by its "chromatoid" staining reaction, and according to the evidence at hand is the form in which the virus is passed between the tick and mammalian hosts. The other two forms described are multiplicative stages, and can only be demonstrated occasionally and with difficulty in mammalian hosts. The name *Dermacentroxenus rickettsi* is proposed for this parasite.

Yellow Fever is spreading in Mexico, since cases have been reported at the port of Salina Cruz on the Pacific Coast far from Yucatan, the focus of the present epidemic. Dr. Noguchi is employing his method of prophylactic vaccination by means of killed cultures of *Leptospira*. It is expected that this vaccine will give good results in view of the fact that yellow fever is one of those diseases that confer complete and permanent immunity.

Current Literature.

Bulletin de la Societe de Pathologie Exotique. February, 1920.

Preliminary Note on a Fever of Unknown Origin observed in Cochin China (P. Noel Bernard).—Investigation into the unclassified "climatic fevers" of the country has led the Pasteur Institute of Saigon to distinguish from the group one definite clinical entity in consideration of the fact that the organism isolated has shown the same general characteristics in every case. The symptoms differ in intensity only, but, according to the predominating clinical feature, the condition has been variously diagnosed as typhoid fever, typho-malaria, pseudo-dengue, five days' fever, seven days' fever, extreme eastern and Indian port fever, an attack of malaria, or simply as gastric trouble *a calore*. In effect it appears to combine the symptoms of pseudo-dengue and of five days' and seven days' fever, though to regard it as a fusion of the three different clinical types in question would be premature. The name "astheno-myalgic fever" is suggested for it as resuming its three essential characteristics. The condition seems to be endemic and to persist to a certain extent all the year round, assuming an epidemic form at intervals. In 1919 the periods of greatest severity occurred in June and August.

Symptomatic Anthrax in Annam (Henri Schein).—The disease observed appears to be epidemic and to be most in evidence towards the end of July. Calves are the chief victims. The symptoms are distress, fever, and infiltration of gas and serum in different parts of the body. Death occurs in from twenty-four to forty-eight hours after the onset. The blood and œdematous fluid contain immobile spore-bearing Gram-negative bacilli, markedly smaller than *B. chauvæi* as known in France. They grow readily in fresh Martin broth under oil of vaseline at a temperature of 30°, and give off a small amount of gas, the broth becoming cloudy in twenty-four hours. The cultures lose their virulence in a very few days, and the author was unable to preserve his strains. On specimens sent to France, Professor Vallée reported that the organism could be stained by the Gram-Nicolle method if previously treated with toluene (unobtainable in Annam at that time), and that experiments on guinea-pigs showed that a serum specific against *B. chauvæi* was also effective against the bacillus from Annam.

A Contribution to the Study of the Sero-reaction and the Fixation of Complement with B. proteus in Exanthematic Typhus (A. Orticoni).—Two cases of suspected typhus were tested by the Weil-Felix method with *B. proteus* type 19. The serum of one of them, who had reached the sixth day of illness, agglutinated the culture at 1 in 200, while that of the other, who was convalescent, agglutinated the same strain at more than 1 in 500. The normal serum used as control remained negative

on every occasion. Later tests showed positive sero-reaction in increasing degrees. No deviation of the complement was obtained by the use of No. 19 *B. proteus* as antigen in connection with the serum of the same two cases. Agglutination of *B. proteus* by the serum of typhus patients would only seem to he para-specific therefore, but it is of great practical value as an aid to diagnosis and the test may, moreover, be used retrospectively.

The Dysenteries at Salonica in 1918 (G. Derrieu). —The author seems to regard *Entamœba tetragena* as different from *E. histolytica*, and considers the former to be more frequently met with. A vegetative type of a hæmatophagous amœba was also seen, Amœbo-bacillary dysentery was diagnosed three times. The most severe and fatal form of dysentery observed by the writer was the necrotic type. The necrosis may affect the whole of the mucous membrane of the large intestine or be localized at certain points, while the same intestine may show a completely necrotic segment adjacent to a segment presenting superficial ulcerations limited to the mucosa. Out of sixteen autopsies, perforation was found in five cases. The treatment indicated was absolute rest for the intestine to prevent both perforation and generalization of the infection when still localized. The Shiga bacillus was usually recoverable in these cases, and *Trichomonas* was frequently found in the stools, becoming more and more numerous towards the end.

A Contribution to the Study of Flagellata of Culicidæ, Muscidæ, Phlebotomi and *Blatta orientalis* (A. Laveran and G. Franchini).—*Herpetomonas, Crithidia* and *Trypanosoma* were found in association in the digestive tube of specimens of *Culex pipiens* collected near Bologna, and all three were subsequently recovered from inoculated mice. The question therefore arises as to whether the infection was a triple one, or whether, under certain circumstances, the *Herpetomonas* is able to develop in mosquitoes and assume the form of a *Crithidia* or of a *Trypanosoma*. The same problem occurs with reference to the Muscidæ, for though neither *Crithidia* nor *Trypanosoma* were found in the various species examined, *Herpetomonas muscæ domesticæ* was identified in specimens of *Sarcophaga hæmorrhoidalis* and trypanosomata were recovered from a mouse inoculated with the *Herpetomonas*. Out of 200 *Phlebotomus papatasii* examined flagellata were found in the digestive tube on four occasions. They were fatal for mice, and would appear to be identical with the *Herpetomonas* obtained by Mackie from *Phlebotomus minutus* and described by him under the name of *H. phlebotomii*. A flagellate discovered in the digestive tube of *Periplancta orientalis*, and pathogenic for mice, is apparently a new form. The authors suggest for it the name of *H. periplanetæ*.

Culicidæ collected by the Anti-Malaria Commission attached to the Armée d'Orient in 1918 (Ch. Joyeux).—The specimens were obtained from those parts of Macedonia, Albania and Greece which were occupied by French troops up to September, 1918. As in 1917, four species of anopheles were represented, viz., *A. maculipennis* (very common), *A. bifurcatus, P. palestinensis* and *M. sinensis* (rare). *Stegomyia calopus* and *Theobaldia longiarcolata* were found on the coast, at Salonica and Ithea, but not in the interior. *T. spathipalpis* was fairly abundant in all seasons. *T. annulata* and *T. fumipennis* were seen in larval form from the beginning of March, though the latter was rare. The larvæ of *Ochlerotatus dorsalis* were found in all qualities of water. *Culex pipiens* L. was ubiquitous. The larvæ of *C. hortensis* Fic. and of *C. apicalis* were very common in fresh water. *Taeniorhynchus richiardii* was sent in in large quantities from the Upper Vardar, especially during the hot months; its eggs were found in both salt and fresh water, but those deposited in the former were white and fell to the bottom. *Uranotænia unguiculata* was obtained on one occasion only, though common in 1917.

Health Conditions and Depopulation in the Congo (E. Jamot).—The report deals with that part of the French colony of Oubangui Chari which lies between the Oubangui river and the southern boundary of the military territory of the Chad, the population being about 100,000. The people belong to the Banda and Mandjia tribes, and are worn out by many years of forced toil. Robust and healthy individuals are rarely seen. Sleeping sickness, yaws, syphilis, leprosy and various diseases of the eye abound. In those parts of the country where sleeping sickness is most common the mortality exceeds the birth-rate to such an extent that the population is visibly dying out. On the author's instigation certain villages have been exonerated from the taxation which is paid in labour and encouraged to cultivate the land for food production, and in view of the excellent results obtained by these measures he urges that Government subsidies should be obtained to enable their application throughout the colony.

A Contribution to the Study of the Ixodidæ: Biological Adaptation of the Ambulacra of the First Pair of Legs (G. Senevet).—On the hypothesis that a relationship exists between the development of the ambulacra (or pads) in the ixodidæ and the biology of the parasite, Senevet has endeavoured to ascertain by measurement whether the hypertrophy of the ambulacra noticed in the larvæ of species which are obliged to attach themselves firmly and hurriedly to a passing host is continued through the pupal and adult stages, and also whether this hypertrophy is less or inexistent in those forms which are laid and hatched on the same host. In nearly all the species of ixodidæ examined the measurements confirmed the theory. They should, moreover, be useful in themselves by providing a guide for the identification of the various larvæ and a means of judging the mode of life of an ixode not yet classified from the point of view of the number of times it requires to change its host.

THE JOURNAL OF EXPERIMENTAL MEDICINE.

Vol. XXXI, No. 2, February, 1920.

Mycosis of the Bovine Fœtal Membranes due to Mould of the Genus Mucor (Theobald Smith).—The author has isolated *Mucor rhizopodiformis* Lichtheim from the diseased chorion of a case and from the lungs and digestive tract of the fœtus.

Experiments on the Nasal Route of Infection in Poliomyelitis (Simon Flexner and Harold L. Amoss).—The authors come to the conclusion that the normal nasal mucosa is an invaluable defence against infection with the virus of poliomyelitis, and that the number of healthy and chronic carriers of the virus is probably determined and kept down through the protective activities of this membrane. The authors have found that antiseptics applied to the nasal mucosa of monkeys upon which the virus has been deposited show little protective action and are of doubtful value. Indeed they are inclined to believe that such substances may be injurious.

Ætiology of Yellow Fever: Comparative Immunological Studies on Leptospira Icteroides and Leptospira Icterohæmorrhagiæ (Hideyo Noguchi).—The author in a series of interesting researches has shown that monovalent immune sera prepared by several successive injections in an animal naturally refractory to *Leptospira icteroides* agglutinate homologous and heterologous strains of that organism, while they agglutinate only very slightly *L. icterohæmorrhagiæ*. The Pfeiffer reaction sharply differentiates the two organisms in most cases. More or less specificity is shown also by the complement fixation test. As regards active immunity, the two leptospiras are somewhat closely related. Noguchi comes to the conclusion that cross-immunity reactions *in vitro* and *in vivo* strongly indicate that *L. icteroides* and *L. icterohæmorrhagiæ* are somewhat closely related, though specifically different. (See Abstracts, in April 15 issue.)

Serum Treatment of Animals Infected with Leptospira icteroides (Hideyo Noguchi).—The use of a polyvalent *L. icteroides* serum of high potency was found to be very useful in the treatment of experimental infections.

Sterilization of Lipovaccines (P. A. Lewis and F. W. Dodge).—The authors come to the conclusion that pneumococcus lipovaccine gives a definite protection against pneumococcus infected in mice, and that the immunizing quality of the vaccine is not greatly diminished by heating it to 130° C. for three hours.

As regards typhoid vaccines, the authors have found that the lipovaccine induces in rabbits a lesser amount of agglutinins than the saline suspension vaccine. They have found also that heating at 130° C. for three hours the typhoid lipovaccine, greatly injures its antigenic properties.

Crescentic Bodies in Æstivo-autumnal Malaria (Mary R. Lawson).—All malarial parasites are extracellular and one may trace the destruction of corpuscle after corpuscle by the migrating parasites of æstivo-autumnal infections. As regards the attachment of the crescent to the red corpuscles, the parasite is extracellular and wraps itself round the corpuscle as a worm wraps itself around a berry. Crescentic bodies go through migratory stages similar to those of other malarial parasites, and it is at times possible to find all the stages in one film, especially in cases of heavy infection and when quinine has not been administered.

The Hæmic Basophile (G. S. Graham).—The basophilic granule of blood and marrow cells does not show the brown colour reaction characteristic of the neutrophilic and eosinophilic granules. The basophile is probably a degenerated or degenerating cell.

Medical News.

UNIVERSITY OF CAMBRIDGE.

DIPLOMA IN RADIOLOGY AND ELECTROLOGY.

In connection with the courses now running in London at University College, and at the Royal Society of Medicine, the Committee for the Diploma propose to announce to the Senate the following dates for the next examination, which will be held at Cambridge: Part I (*a* and *b*), Tuesday, July 27, 1920, with practical work and viva voce examination on July 28; and Part II (*a* and *b*), Thursday, July 29, with practical work on July 30.

Candidates desiring to take the diploma by thesis next term under Regulation 13, should apply to the Secretary, Dr. Shillington Scales, Medical Schools, Cambridge, without delay, for the necessary certificate forms.

The Committee propose to hold courses of lectures and practical work in Physics and in Electrology during the ensuing long vacation in Cambridge, beginning June 22 and finishing about the middle of August, and in Radiology in the next Michaelmas Term, beginning October 12 and finishing in time for the examination at Christmas. The necessary clinical work can be carried out at Addenbrooke's Hospital, Cambridge. The Physics course will be given by Dr. Crowther, by arrangement with Professor Sir Ernest Rutherford; the courses in Radiology and Electrology by approximately the same lecturers, all leading workers in these subjects, who have given the courses now running in London. The holding of these courses in Cambridge will, however, be dependent on a sufficient number of students entering for them, and for this reason early application should be made to the Secretary, Dr. Shillington Scales. It is hoped in future to hold courses and examinations twice a year, the courses in Cambridge alternating with those in London, so that candidates from overseas may have an opportunity of taking the diploma.

Original Communications.

SOME SOUDANESE DIPHTHEROIDS.

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and
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Contents. — *Introductory — Historical — Sudan Strains — Classification — Summary — Acknowledgments—Addendum—References—Illustrations.*

Introductory.—There are always a few cases of diphtheria, or of diseases simulating it, to be found in the Anglo-Egyptian Sudan scattered throughout the year but these become slightly more frequent during the autumn and winter.

The diagnosis of diphtheria is, however, fraught with difficulty as, in addition to the true Klebs-Loeffler bacillus, other organisms may be found in cases clinically simulating diphtheria.

On the other hand difficulty may also arise from organisms resembling the diphtheria bacillus but found in conditions which do not resemble that disease clinically.

Further, in our brief periods of sojourn in Egypt we have met with similar difficulties in diagnosis.

In the Sudan, as in other countries, a species of *Nocardia* (fig. 1) occurs in healthy and diseased tonsils and is apt to confuse the diagnosis, especially when present only as detached segments without exhibiting long or branched forms.

In regard to the eye we have met with true diphtheria of the conjunctiva in a British officer, while conjunctival xerosis has been described recently by Archibald as occurring in the Sudan. Since his description we have met with several cases during this year in the inflamed conjunctiva (fig. 2) and also in the non-inflamed conjunctiva which is well illustrated in fig. 1 of the plate attached to Archibald's paper of May 1 in this journal. As this condition is due to a diphtheroid (fig. 3) it adds an interesting form to those known to exist in the Sudan.

We may perhaps mention at this point that avian diphtheria is not rare in the Sudan, where we have frequently isolated its organism.

We began to collect material for this paper several years ago but unfortunately we have lost the whole of our early records and can therefore only draw attention to our quite recent work.

Notwithstanding the loss of these records we think that the few remarks we are about to offer may be of interest to our fellow practitioners in the Tropics, as they are an attempt to formulate a scheme for the diagnosis of true and false diphtheria in these lands.

Historical.—In 1883 at the "Congress für Innere Medicin," held at Wiesbaden, Klebs showed that peculiar bacilli could be seen near the surface of sections of diphtheritic false membranes obtained from post-mortems and coloured with methylene blue. He considered that this was a second form of diphtheria, distinct from that which he held to be caused by an organism which he called *Micrococcus diphtheriticum* and which was created for a micrococcus and a fungus found by one of his pupils, "Brown," in 1877.

The new bacilli were uniform in length, very slender and frequently presented spores at each end. These observations were supported by Edlessen of Kiel. In the same year Kuschbert and Neisser differentiated the *Bacillus xerosis* in cases of xerosis of the conjunctiva. In 1884 Loeffler having found deeply staining small rods arranged in groups of false membranes, was able to cultivate them in the form of yellowish-white colonies on blood serum containing 25 per cent. of broth. From these pure cultures were obtained and from them guinea-pigs were infected by subcutaneous injection. These animals, dying about the third or fourth day after inoculation, were found to show characteristic appearances in the form of greyish-white necrotic local lesions, hæmorrhagie subcutaneous œdema, effusion into the pleural and peritoneal cavities, lobular consolidation of the lungs, catarrhal inflammation of the kidneys and especially reddening and hæmorrhages into the *supra-renal capsules*. The bacilli mentioned above were recovered from the local lesions but were not found in the organs, a fact which was held to prove that the lesions of these organs were due to a toxin. In rabbits false membranes were experimentally produced by inoculation of the opened trachea and in these membranes the typical bacilli were discovered. In guinea-pigs he also noted post-diphtheritie paralysis.

Loeffler also found these typical bacilli in one apparently healthy child.

In 1887 he extended his observations and recorded the presence of an avirulent organism morphologically similar to the causal agent. In 1890 he further recognized a *diphtheria group* of organisms containing forms allied to the true bacillus.

This group contained: —

1. The true pathogenic bacillus which he called "Bacillus bei Diphtherie des Menschen" (1884). This was the type.
2. His own avirulent strain (1887).
3. The non-pathogenic bacillus of von Hofmann-Wellenhof (1888).
4. The xerosis bacillus of Kutschbert and Neisser (1883).
5. The avirulent diphtheria-like bacillus of Zarniko (1889).

The above may be taken as the first attempt to classify the so-called diphtheroids, as Loeffler pointed out that the last four organisms differed from the first in certain morphological points, in the good growth on agar at the room temperature of a temperature climate, and in avirulence to guinea-pigs. Zarniko's organism seems to be the same as Loeffler's avirulent strain, but as his original papers in the sixth volume of the *Centralblatt für Bakteriologie* are not available in Khartoum we cannot say whether this is, or is not, correct.

Since the days when Loeffler brought forward this classification, diphtheroid organisms have multiplied greatly. Little, however, has been done to consolidate the information concerning them and hence their recognition is a matter of great difficulty.

In 1894 Parke and Beebe showed that bacilli, which morphologically resembled the Klebs-Loeffler organism, could be differentiated therefrom by sugar reactions. They formulated the following groups:—

I. Those which do not ferment glucose.
II. Those which do ferment glucose:—
(*a*) Forms avirulent to guinea-pigs, but otherwise exactly like the Klebs-Lœffler germ.
(*b*) Forms virulent to guinea-pigs.

This was a great advance in the process of differentiation and was followed in 1896 by Lehmann and Neumann who formulated a new genus for these germs. This genus they named *Corynebacterium* (from κορύνη, a club) and defined it as follows:—

"Rods, colouring interruptedly (striped) with weak solutions of stains and hence composed of parts possessing different staining properties, not stained by methods for the tubercle bacillus and frequently clubbed, wedge-shaped or pointed.
"*Type species.—Corynebacterium diphtheriæ* Klebs 1883 emendavit Lehmann and Neumann, 1896."

In 1898 Kurth investigated the action of diphtheroids on sugars and named two species viz., *B. pseudodiphthericus alcalifaciens* and *B. pseudodiphthericus acidumfaciens*. Eberson suggests that the first is the von Hofmann-Wellenhof organism while the second one is to be considered as unrecognizable.

From 1894 to 1904 Migula studied the classification of the bacteriaceæ. He took a step backward in his "System der Bakterien" in recognizing the diphtheroids as belonging to the genus *Bacterium* as defined by him. He held that *B. septatum* Gelpke was a distinct organism, but Eberson is probably correct in making it a synonym of the xerosis bacillus.

In 1897 and in 1901 Chester formulated and expanded a new bacterial family which he called *Mycobacteriaceæ* and which he designed to hold diphtheroids and allied forms, all of which he included in Lehmann's and Neumann's genus *Mycobacterium*, thus suppressing *Corynebacterium*, which was a retrograde step.

It is necessary to be clear as to the definition of this family, which is as follows:—

Eubacteriales.—Non-motile cells, long or short, cylindrical or filamentous, without a sheath, often clavate, cuneate or irregular, often with enclosed granules, without endospores and with a tendency to form branches.
Type genus.—Mycobacterium Lehmann and Neumann 1896.

If this definition be accepted the diphtheroids producing spores like *B. erythematis* Demme 1887 and those which are motile like *B. endocarditis griseus* of Weichselbaum are excluded, and must find some other resting place.

In 1904 Graham Smith published a valuable paper on these organisms and increased the number of those bearing names with clear definitions.

In 1904 and 1907 Hamilton investigated *Ruediger's* 1903 *virulent pseudodiphtheria bacillus* as well as strains similar to those of Williams in 1898 and Davis in 1899. She divided aural diphtheroids into two classes as follows:—

I. Forms fermenting saccharose but not maltose and seldom virulent for guinea-pigs.
II. Forms fermenting maltose but not saccharose and often virulent for guinea-pigs.

With regard to all these strains Eberson points out that the diphtheria antitoxin is powerless to resist their action and considers that they are all identical with *Bacillus auris* Graham Smith 1904 and that possibly they are pathogenic agents.

In 1912 Lehmann and Neumann recognized the following organisms as belonging to their genus *Corynebacterium*:—

(1) *C. mallei* (Loeffler 1886).
(2) *C. pseudodiphtheriticum* (Hofmann-Wellenhof 1888).
(3) *C. diphtheriæ* (Klebs 1883).
(4) *C. xerosis* (Kuschbert and Neisser 1883).
(5) *C. necrophorum* (Flügge 1886).
(6) *C. fusiforme* (auctores).

They also included *C. diphtheriæ avium* Kruse 1896 and several other forms. With regard to these organisms *C. mallei* is Gram-negative and differs in many ways from the next three organisms while *C. necrophorum* is an anaërobe and most likely *Cohnistreptothrix cuniculi* (Schmorl 1891), though this is not certain.

C. fusiforme would now be classified in the genus *Fusiformis* Hoelling 1910.

Also in 1912 Morse studied diphtheroids on the same lines as those on which the Winslows so successfully classified the *Coccaceæ*. She did not refer to Lehmann and Neumann's genus but divided the *Diphtheria Group* of bacilli as follows:—

A. The Diphtheria subgroup:—
1. Virulent forms.
Bacillus diphtheriæ Loeffler 1884.
2. Avirulent forms.
These are distinguished by possessing a heavier growth and less acid production than the virulent forms.

B. The Hofmann Diphtheroid subgroup:—
The species belonging to this subgroup were differentiated as follows:—
A. Colour of cultures salmon pink:—
Very heavy growths—*B. hoagii* Morse 1912.
B. Colour of cultures—white to yellow:—
1. Non-acid producers in carbohydrates, *B. hofmanni* Morse 1912.
2. Acid producers in carbohydrates:—
(*a*) Acidity in saccharose. *B. exerosis* Kuschbert and Neisser, 1883.
(*b*) No acidity in saccharose, *B. flavidus* Morse 1912.

In the years 1916 and 1917 Mellon published interesting accounts of an organism which was recovered by puncture from a case of pulmonary disease characterized, *post-mortem*, by fibrosis and infiltration of the alveolar wall and chronic passive congestion, and, *ante-mortem*, by clinical signs resembling phthisis.

The organism isolated was very pleomorphic and

presented a coccus and a bacillary diphtheroid. A similar organism was described by Walker and Adkinson in 1917. In 1918 Eberson demonstrated that the coccus was antigenetically distinct from the bacillary diphtheroid which is called *C. enzymicum* (Mellon 1917).

In 1917 Buchanan, and later the Committee of American Bacteriologists, dealt with the classification of these forms in their papers and reports upon the nomenclature and classification of bacteria.

In regard to the matter in hand we note that they recognize Nagell's *Schizomycetacea* and Schroeter's *Eubacteriales* (Eubacteria). The latter however is not a new name, as they indicate, but has been used by authors for years, e.g., see Stevens (1913) "Fungi which Cause Plant Disease," p. 18.

They also recognize the family *Mycobacteriaceæ* Chester 1897 as one of the families of the *Eubacteriales* and they give it the following genera:—

(1) *Actinomyces* Harz 1877.
(2) *Nocardia* Trevisan 1889.
(3) *Mycobacterium* Lehmann and Neumann 1896.
(4) *Corynebacterium* Lehmann and Neumann 1896.
(5) *Fusiformis* Hoelling 1910.
(6) *Leptotrichia* Trevisan 1879.

But to classify Actinomyces, Nocardia, and Leptotrichia as bacteria is, in our opinion, a retrograde step.

We would therefore only recognize:—

(1) *Mycobacterium* Lehmann and Neumann 1896,
(2) *Corynebacterium* Lehmann and Neumann 1896,
(3) *Fusiformis* Hoelling 1910.

as named genera of the family, though it is obvious that there is a need for more genera to be created to cover the known varieties.

In 1918 Eberson inquired into diphtheroids in general and classified them in Lehmann and Neumann's genus *Corynebacterium*, the definition of which he altered as follows:—

"Morphological resemblance to the diphtheria organism. Gram-positive, non-motile, absence of spores, presence or absence of metachromatic granules, no gas production in carbohydrate mediums."

In the genus so defined he recognizes the following groups of organisms which (slightly amended as to names) is as follows:—

Group I.—*Diphtheria*. Type: *C. diphtheriæ* (Klebs 1883).
Species: *C. pseudodiphtheriæ* Eberson 1918.

Group II.—*Pseudodiphtheriticum*. Type: *C. pseudodiphtheriticum* (v. Hofmann-Wellenhof 1883).
Species: *C. ceruminis* (Graham Smith 1904) and *C. delicatum* Eberson 1918.

Group III.—*Xerosis*. Type: *C. xerosis* (Kuschbert and and Neisser 1883).
Species: *C. epidermidis* Eberson 1918. *C. suppuratum* Eberson 1918. *C. auris* (Graham Smith 1904) and *C. cerebralis* Eberson 1918.

Group IV.—*Nodosum*. Type: *C. nodosum* (Lustgarten-Mannaberg 1887).
Species: *C. acidum* Eberson 1918, *C. ascites* Eberson 1918, *C. flocculens* Eberson 1918.

Group V.—*Pigment-forming diphtheroids*. Type: *C hoagii* (Morse 1912).
Species: *C. aurantiacum* Eberson 1918, *C. glandulæ* Eberson 1918, *C. striatum* (von Besser) emendavit Chester 1901, *C. segmentosum* Eberson 1918.

Group VI.—Gelatine liquefiers. Type: *C. putidum* Eberson 1918.

Group VII.—*Anaërobes associated with specific clinical manifestations*. Type: *C. typhiexanthematici* (Plotz 1915).
Species: *C. acnes* (Gilchrist 1901).

Group VIII.—*Pyogenic diphtheroids in animals*. Type: *C. pseudotuberculosis* (Preisz 1895).
Species: *C. pyogenes* Glage 1903, *C. vaccinæ* (Galli-Valerio 1904).

Group IX.—*Anaërobic diphtheroids associated with diseased lymph glands*. Type: *C. lymphophilus*, (Torrey 1916).

He rejects a number of organisms which used to be included in the genus, for the following reasons:—

A. Do not conform with the definition of the genus as given above:—
1. *B. endocarditis griseus* Weichselbaum, which is motile.
2. *B. erythematis* Demme 1887, which forms spores.
3. *B. epidermidis* Bordoni-Uffreduzzi, which has spores.
4. *B. clavatus* Flügge 1894, which is motile.
5. *De Simoni's diphtheroid* 1898, which has spores.
6. *B. pseudodiphtheriticus gazogenes*, which produces gas.

B. Are synonyms of the names given in the groups:—
1. *B. pseudodiphtheriticus alcalifaciens* Kurth 1898, which is the same as Hofmann's bacillus and *B. hofmanni* Morse 1912.
2. *B. septatus* Gelpke, which is the same as the xerosis bacillus.
3. *B. renalis bovis* Enderlein 1891, which is Glage's *C. pyogenes*.
4. *B. striatus flavus* v. Besser } which are *C. striatum* (von Besser) emendavit Chester 1901.
5. *B. striatus albus* v. Besser }
6. *B. diphtheroides* Klein 1900, which is *C. pyogenes*.
7. *B. variabilis lymphæ vaccinalis* Levy and Fickler 1901, which is *C. striatum*.
8. *B. diphtheroides brevis* Graham Smith 1904, which is *C. acidum*.
9. *B. diphtheroides liquefacies* Graham Smith 1904, which is *C. putidum*.

C. Unrecognizable:—
B. pseudodiphtheriticus acidum faciens Kurth 1898; description incomplete.
C. hodgkinii Billings and Rosenow 1913, as the strains differ and are probably not connected with the disease and represent more than one organism.

Sudan.—In regard to the history of Sudanese diphtheroids, Balfour in the second report of these laboratories gives a passing reference to the discovery of the Klebs-Loeffler bacillus in typical cases of diphtheria in the Sudan where the disease is called Lahada, which is rarely a name for tonsillitis.

In the fourth report in Volume A, p. 239, he contributes a valuable paper on "Diptheria in the Tropics," in which he states that on several occasions he has met with a coccal form of the Klebs-Loeffler bacillus which when sub-cultured on agar turns into a bacillary form though remaining coccal on blood serum. One of his organisms was tried on a guinea-pig which was not affected locally or constitutionally thereby. The question of this

mutation or pleomorphism in diphtheroids has been ably studied by Eberson on *C. enzymicum* (Mellon 1917). He excluded a symbiotic coccus from the bacillary organism and then proceeded to demonstrate that this latter organism, under certain circumstances, could be made to assume a diplococcal appearance. These diplococcal bodies were demonstrated by Castellani's absorption method to be antigenetically similar to the bacillary forms and different from the symbiotic coccus.

This granule or diplococcal stage has been seen by us from time to time (fig. 4) in the diphtheroids with which we have worked and we can therefore confirm the observations made by Balfour and by Eberson. Further, we are of the opinion that these may represent "an infective granule phase" and may be the infective agent.

With regard to the *xerosis of the conjunctiva*, its existence in the Sudan has been described recently by Archibald as already noted, but his strains appears to us to be different from *C. xerosis* (Kuschbert and Neisser 1883) in several respects, and therefore we shall formulate a distinct name for his organism.

It may perhaps be of interest to note that Archibald's cases occurred in non-inflamed eyes, while in one of those seen by us the initial inflammation was so severe that the medical officer in charge considered that, clinically, it resembled a case of diphtheria of the conjunctiva. It was, however, very different from the case of true diphtheria of the conjunctiva mentioned above, which was infinitely more serious, but readily yielded to anti-toxic treatment.

The spore-bearing organism, observed by Balfour as being present along with the Klebs-Loeffler bacillus in a case of diphtheria in the Sudan, has been studied in detail by Lieutenant Smith, of the Canadian Medical Corps, working in these laboratories.

Having reviewed the subject of diphtheroids as far as the meagre literature available to us in Khartoum permits, we will now turn to the consideration of our diphtheroid strains.

Sudan Strains: Strain I: Clinical Notes.—The first case is from Khartoum North. It occurred in a small native boy who suffered from fever associated with the formation of a whitish membrane on his tonsils. As the organism (fig. 5) found by direct examination and in serum cultures resembled the Klebs-Loeffler bacillus he was given diphtheria antitoxin (8,000 units), but this did him neither harm nor good, and under local and general treatment his temperature fell gradually from 103° F. to normal in five days, while the membrane also gradually disappeared, but the tonsils still remained large. Apart from his throat and the fever, the boy was in good condition, and when the temperature reached normal appeared to be quite well.

Two weeks after the commencement of the illness (the tonsils being still enlarged and his throat congested) a swab was examined for bacilli, and the same diphtheroid organism easily obtained in pure growth.

Ten days later his tonsils had returned to normal, but his throat remained congested. This time the bacilli were only obtained in culture.

Fourteen days later, all local and general symptoms having disappeared, the same diphtheroids were obtained by cultivation, but only by this method.

A few days later they could not be found in culture or in direct examination.

Organism.—Morphologically it, in general, resembled the Klebs-Loeffler bacillus, as can be judged by a study of fig. 5. Its length varied from 1·8 to 4·2 microns, and its breadth was about 0·4 microns.

The organism is therefore composed of rod-like forms, colouring well with the ordinary strains, Gram-positive, not acid-fast, and with polar granules. It is non-motile and does not form spores, but gives rise to club forms in old cultures.

Culturally.—It grew aërobically at 37° C. and at 22° C., but did not grow anaërobically.

On Loeffler's blood serum it gave a growth closely resembling that of the Klebs-Loeffler organism. It did not liquefy blood serum or gelatine. It did not produce markedly coloured growths on blood serum.

Biochemically.—Its growth in carbohydrate media produced acidity in some, but not in all, the chemicals tested, but it never formed gas.

Qualitatively its carbohydrate reactions were as follows:—

I. Monosaccharides:—
- (*a*) *Hexoses:* It produced acid but no gas in *Glucose*, *Lævulose* (Fructose) and *Galactose*.
- (*b*) *Pentose:* It gave rise to acid but no gas in *Rhamnose* (Isodulcite).

II. Disaccharides:—
It produces acidity without gas in *Maltose*, *Lactose* and *Saccharose*.

III. Trisaccharide:—
It forms acid without gas in *Raffinose*.

IV. Polysaccharides:—
It ferments *Dextrin* and *Inulin*, but not *Amylum* (starch) with the formation of acid, but not gas.

V. Glucoside:—
It forms acidity in *Salicin*.

VI. Alcohols:—
- (*a*) Trihydric: *Glycerol*, no change.
- (*b*) Tetrahydric: *Erythrol*, no change.
- (*c*) Pentahydric: *Adonitol*, no change.
- (*d*) Hexahydric: *Dulcitol* and *Mannitol* acid formation, but no gas.

For its quantitative reactions, see below.

With regard to other biochemical reactions, it produced acid and clot in *Milk* and reduced *Nitrates*, but it did not produce *Indol* nor give the *Voges-Proskauer reaction*.

Animal Inoculations showed that it was *avirulent* for guinea-pigs.

Strain II: Clinical Notes.—This strain was obtained from a Greek baby living in Port Sudan on the Red Sea Littoral. It was noticed to have some difficulty in respiration, and on examination both tonsils were found to be enlarged and covered

with a greyish membrane. The fever never rose above 99·2° F. during the whole illness, but the child received 6,000 units of diphtheria antitoxin, and in four days, the membrane having disappeared from the tonsils, the child was considered to be convalescent.

Organism.—The germ recovered from the swab sent to the laboratory was morphologically similar to the Klebs-Loeffler bacillus, as can be judged by an examination of fig. 6. Its length varied from 1·5 to 2·8 microns, while its breadth was 0·4 microns.

It is therefore a rod-like organism colouring well with ordinary stains, Gram-positive, but not acid-fast and with polar granules. It is non-motile and does not form spores.

Culturally.—It grew aërobically at 37° C. and at 22° C., but it was not tested anaërobically.

On Loeffler's blood serum it produced a growth resembling that of the Klebs-Loeffler bacillus. It did not liquefy blood serum or gelatine, and it did not produce coloured growths on blood serum. It was not tested on potato.

Biochemically.—Its growth in carbohydrate media produced acidity in some, but not in all, the chemical substances tested, but it never formed gas.

Qualitatively its carbohydrate reactions were as follows:—

I. Monosaccharides:—
- (*a*) *Hexoses:* Acid but no gas was produced in *Glucose*, *Lævulose* (Fructose) and *Galactose*.
- (*b*) *Pentose:* No acid or gas formed in *Rhamnose*.

II. Disaccharides:—
Acid without gas appeared in *Maltose* and *Lactose*, but not in *Saccharose*, which was unchanged.

III. Trisaccharide:—
There was neither acid nor gas in *Raffinose*.

IV. Polysaccharides:—
There was slight acidity, but no gas in *Dextrin*, *Inulin* and *Starch*.

V. Glucoside:—
Acid, but no gas appeared in *Salicin*.

VI. Alcohols:—
- (*a*) Trihydric: Glycerol, slight acidity only.
- (*b*) Tetrahydric: *Erythrol*, no change.
- (*c*) Pentahydric: *Adonitol*, no change.
- (*d*) Hexahydric: *Dulcitol* and *Mannitol*, no change.

For the quantitative figures of the acidity formed in these reagents, see the table given below.

In regard to other biochemical reactions it produced slight acidity and a deposit in *Milk*, but no clot. It reduced *Nitrates*, but was negative in regard to *Indol* formation and the *Voges-Proskauer reaction*.

Animal Inoculations proved that it was avirulent to guinea-pigs.

Strain III: Clinical Notes.—This organism was obtained from a small native boy living in Khartoum. He came to the hospital suffering from fever and tonsillitis with small patches thereon. He did not receive antitoxin, and rapidly recovered under local treatment.

Organism.—Morphologically it, in general, resembled the Klebs-Loeffler bacillus, as may be judged from a study of fig. 7. In length it varied from 1·5 to 3·2 microns, and in breadth it was about 0·4 micron. It was composed of small rod-like forms, Gram-positive, but not acid-fast, and it showed polar granules. It was non-motile and did not form spores.

Culturally.—It grew aërobically at 37° C. and at 22° C. On Loeffler's blood serum it gave a growth closely resembling the Klebs-Loeffler bacillus. It did not liquefy blood serum or gelatine. It did not produce markedly coloured growths on blood serum. In broth there was a general turbidity. On glycerine agar no pigment was produced, while on potato it gave rise to dewdrop-like colonies, which subsequently became white (fig. 8).

Biochemically.—Its growth produced acidity, but no gas in certain carbohydrate media, as shown below:—

I. Monosaccharides:—
- (*a*) *Hexoses:* Acid without gas appeared in *Glucose*, *Lævulose* (Fructose) and *Galactose*.
- (*b*) *Pentose:* There was acidity without gas formation in *Rhamnose*.

II. Disaccharides:—
It produced acidity, but no gas in *Maltose*, *Lactose* and *Saccharose*.

III. Trisaccharide:—
There was acid formation, but no gas in *Raffinose*.

IV. Polysaccharide:—
It fermented *Dextrin*, *Inulin* and *Starch* with formation of acid and no gas.

V. Glucoside:—
Acid without gas was produced in *Salicin*.

VI. Alcohols:—
- (*a*) Trihydric: *Glycerol*, no change.
- (*b*) Tetrahydric: *Erythrol*, no change.
- (*c*) Pentahydric: *Adonitol*, no change.
- (*d*) Hexahydric: *Dulcitol* and *Mannitol* acidity, but no gas.

In regard to other biochemical reactions it produced acid and clot in *Milk*, reduced *Nitrates*, but did not form either *Indol* nor give the *Voges-Proskauer* reaction.

Animal Inoculations.—It was avirulent for guinea-pigs.

Classification.—It is obvious that the three organisms described above have much in common and that Strains I and III are the same organism, while they both differ in many respects from Strain II.

They all belong to Linnæus's Class *Fungaceæ* because they are *Thallophytes* without chlorophyll or chromatophores, and to Naegli's subclass *Schizomycetacea* because the usual form of vegetal nucleus is absent, and because reproduction is by fission.

Reagents	Monosaccharides				Disaccharides			Trisaccharides	Polysaccharides			Glucosides	Alcohols					Remarks
	Glucose	Lævulose	Galactose	Rhamnose	Maltose	Lactose	Saccharose	Raffinose	Dextrin	Inulin	Amylum	Salicin	Glycerol	Erythrol	Adonitol	Dulcitol	Mannitol	
Strain I	2·5	3·2	1·6	2·3	2·8	1·6	2·1	1·4	1·7	3·3	0·0	4·0	0·0	0·0	0·0	0·2	1·3	This resembles Strain III
,, II	0·7	1·1	1·2	0·0	1·6	0·6	0·0	0·0	0·5	0·3	0·8	0·4	0·6	0·0	0·0	0·0	0·0	Differs from I and III
,, III	3·0	1·8	1·5	0.3	2·8	2·0	2·4	2·7	1·6	1·5	0·6	1·6	0·0	0·0	0·0	0·6	1·0	This seems to be the same as Strain I

The important differences are that I and III ferment Saccharose, Raffinose and Mannitol, which II does not, while it ferments Glycerol, which I and III do not.

Further, I and III produced acid and clot in milk, while II only produces acidity.

They must also be placed in Schroeter's order *Eubacteriales* because they do not contain sulphur or bacteriopurpurin.

As they are elongated cells which may be clavate or irregular in shape and contain granules they come into Chester's family *Mycobacteriaceæ*.

As our strains are not acid-fast and are not obligatory anaërobes they come under the genus *Corynebacterium* Lehmann and Neumann 1896.

It is now necessary to inquire into the modern definition of this genus, which is as follows:—

Mycobacteriaceæ.—Composed of Gram-positive rod-like forms, not acid-fast, often with club-shaped swellings at the poles, generally with variously staining segments or granules, non-motile, without endospore formation, growing aërobically, but often capable of anaërobic cultivation, never forming gas in carbohydrate media in which they may or may not produce acidity.

Type Species.—Corynebacterium diphtheriæ (Klebs 1883).

The genus so defined should be termed *Corynebacterium* Lehmann and Neumann 1896 emendavit Eberson 1918, Chalmers and Macdonald 1919.

By this definition the following organisms which came under the older definitions are now excluded:—

I. All Gram-negative forms of which the type is *Bacillus mallei* Loeffler.

II. All true anaërobes of which *B. typhi-exanthematici* Plotz is the type.

III. All forms producing gas in carbohydrate media of which the so-called *B. pseudo-diphthericus gazogenes* Jacobson 1908 may be the type.

Having excluded these forms we can divide "the genus *Corynebacterium* sensû stricto into the following groups:—

A. Gelatine liquefied:— (1) *Putidum Group.*

B. Gelatine not liquefied:—

I. Pigment markedly formed on blood serum. (2) *Hoagii Group.*

II. Pigment not markedly formed on blood serum:—

(a) Acid produced in glucose and often in other carbohydrates. (3) *Klebs-Loeffler Group.*

(b) Acid not produced in glucose or other carbohydrates. (4) *Hofmann-Wellenhof Group.*

The first group has as its type species *C. putidum* Eberson 1918 found in ascitic fluid, the second has as its type *C. hoagii* (Morse 1912) and includes the diphtheria-like bacilli found in turkeys by Graham-Smith.

The von Hoffman-Wellenhof Group has as its type *C. pseudodiphtheriticum* (Hofmann-Wellenhof 1888) and includes the so-called *Bacillus diphtheroides gallinarum* named in 1904 by Graham-Smith and often found in fowls in the Sudan. It should be named *C. gallinarum*. The xerosis bacillus of dogs and guinea-pigs should also come into this group and many other forms scattered throughout bacteriological literature.

At the moment only Group 3, *The Klebs-Loeffler Group*, concerns us because the Sudan diphtheroids obviously fall into this category.

We propose to divide this group into two subgroups as follows:—

Subgroup A:—Members of the Klebs-Loeffler group morphologically resembling *C. diphtheriæ* (Klebs 1883).

Subgroup B:—Members of the Klebs-Loeffler group morphologically unlike *C. diphtheriæ* (Klebs 1883).

The various species known to us and belonging to these two subgroups are as follows:—

Subgroup A.

(1) *C. diphtheriæ* (Klebs 1883).
(2) *C. xerosis* (Kuschbert and Neisser 1883).
(3) *C. muris* (Klein 1903).
(4) *C. auris* (Graham-Smith 1904).

(5) *C. maculatum* (Graham-Smith 1904).
(6) *C. enzymicum* (Mellon 1917).
(7) *C. pseudodiphtheriæ* (Eberson 1918).
(8) *C. gordoni* nomen novum.
(9) *C. paragordoni* nomen novum.
(10) *C. archibaldi* nomen novum.
(11) *C. sudanensis* nomen novum.

Subgroup B.

(1) *C. nodosum* (Lustgarten-Mannaberg 1887).
(2) *C. epidermidis* (Eberson 1918).
(3) *C. flocculens* (Eberson 1918).
(4) *C. suppuratum* (Eberson 1918).
(5) *C. ascites* (Eberson 1918).
(6) *C. cerebralis* (Eberson 1918).
(7) *C. acidum* (Eberson 1918).

In the present communication we are only concerned with the first subgroup, which we now proceed to define.

Subgroup A.

Definition: A Corynebacterium is said to morphologically resemble *C. diphtheriæ* when it is in the form of slightly curved or nearly straight rods varying in length but generally thin, usually with granules or bands when stained but may be coloured uniformly, usually with rounded ends and often arranged in a palisade.

Type: The type is *C. diphtheriæ* (Klebs 1883) which we will proceed to define together with the other members of this subgroup.

(1) *C. diphtheriæ* (Klebs 1883): *Corynebacterium* capable of growing below 25° C. Producing rounded raised translucent greyish white or very slightly yellowish, discrete colonies in twelve to twenty-four hours on Loeffler's blood serum, which is not liquefied. Forming on potato a thin dry or hardly perceptible whitish growth. Producing acidity in glucose, lævulose, galactose, maltose, dextrin and glycerol but not in saccharose or mannitol. In regard to lactose there appear to be strains which do, and others which do not, produce acidity in this sugar. In regard to glucosides, its action therein does not appear to have been studied fully. Gives rise to acidity without clot in milk.

Virulent for guinea-pigs with death in three to four days with characteristic lesions. Produces toxins.

Originally found in diphtheritic lesions.

(2) *C. xerosis* (Kuschbert and Neisser 1883): Synonym *B. septatum* Gelpke. *Corynebacterium* incapable of growing below 25° C. Growing on blood serum more slowly than *C. diphtheriæ*. Producing on potato an invisible film. Forming acid in glucose, lævulose, galactose, maltose and saccharose but forming no acid in lactose, dextrin or mannitol. Reaction in milk unknown to us.

Avirulent for guinea-pigs and incapable of reproducing its associated lesions in the eyes of animals.

Originally found in eyes attacked with xerosis of the conjunctiva but can occur in normal eyes.

(3) *C. muris* (Klein 1903): *Corynebacterium* with its capability of growth below 25° C. unknown. Growing on blood serum like *C. diphtheriæ* and producing no visible growth on potato. Producing acidity in glucose, but action on other carbohydrate media unknown.

Virulent for guinea-pigs.

Originally found in diseased mice and rats.

(4) *C. auris* (Graham-Smith 1904), synonym: *B. ruedigeri* (Mellon 1917), and also Hamilton's strains. *Corynebacterium* capable of growing below 25° C. On blood serum resembling *C. diphtheriæ* but of slower growth. On potato producing a brownish-yellow growth. Gives rise to acidity in glucose and maltose but not in saccharose. Milk unchanged.

Virulent for guinea-pigs.

Originally found in cases of otitis.

(5) *C. maculatum* (Graham-Smith 1904): *Corynebacterium* capable of growing below 25° C. On blood serum producing in twenty-four hours opaque white colonies otherwise similar to *C. diphtheriæ*. No visible growth on potato. Glucose is rendered faintly acid. Milk is unchanged.

Avirulent to guinea-pigs.

Originally found in the throat of a possible diphtheritic contact.

(6) *C. enzymicum* (Mellon 1917) emendavit Eberson 1918. This is the bacillary form only. *Corynebacterium* capable of growing below 25° C. On blood-agar producing very fine transparent colonies in twenty-four to forty-eight hours which became translucent or gray. No growth on potato. Acidity in glucose, maltose, lactose, saccharose, dextrin, inulin and glycerol. Milk acid and clot.

Virulent for guinea-pigs.

Originally obtained from a case of fibrosis of the lung.

(7) *C. pseudodiphtheriæ* (Eberson 1918): Synonym pseudodiphtheria bacillus of Loeffler 1887. *Corynebacterium* capable of growing below 25° C. and resembling *C. diphtheriæ* in all particulars except avirulence for guinea-pigs and the non-production of toxins.

Originally isolated from hypertrophied tonsils.

Remarks: As this definition stands one must accept the possibility of a lactose fermenting strain and of another incapable of acting in this manner. Our Strain II

closely agrees with the definition of an avirulent lactose fermenting strain. It grows below 25° C. On Loeffler's blood serum it produces a growth resembling *C. diphtheriæ*. It was unfortunately not tested on potato. It produces acidity in glucose, lævulose, galactose, maltose, lactose, dextrin, and glycerol, but not in saccharose and mannitol. It is true that it forms acid in inulin, starch and salicin but we have been unable to find the result of the action of the Klebs-Loeffler organism on polysaccharides and glucosides in the literature available to us in Khartoum.

It gives rise to acidity without clotting in milk. It was found in a case of tonsillitis associated with the formation of a membrane.

It may be a variety of corynebacterium distinct from *C. pseudodiphtheriæ* but it so closely resembles what is known of this organism that we prefer to consider it to be the same variety at present.

(8) *C. gordoni* nomen novum: *Corynebacterium* incapable of growing below 25° C. Growth on blood serum good in eighteen hours and very coherent. Growth on potato unknown. Acidity produced in glucose. Milk remains unchanged.

Avirulent.

Originally found in the throat.

(9) *C. paragordoni* nomen novum: *Corynebacterium* incapable of growing below 25° C. Producing gray, sharply outlined, coherent colonies on blood serum. Growth on potato unknown. Acidity produced in glucose. In milk forms acid and clot.

Avirulent.

Originally found in the throat.

(10) *C. archibaldi* nomen novum: *Corynebacterium* incapable of growing below 25° C. Producing on blood serum growths resembling those of *C. diphtheriæ* but very coherent. Growing on potato in the form of a fine almost invisible growth. Producing acidity in galactose, maltose and lactose but not in glucose, lævulose, saccharose, dextrin or mannitol. Forming acid without a clot in milk.

Avirulent for guinea-pigs but can reproduce its lesions in the eyes of rabbits.

Originally found in cases of epithelial xerosis of the conjunctiva in the Anglo-Egyptian Sudan.

Remarks: This is the organism found by Archibald and subsequently by ourselves as mentioned in the introductory and historical sections of this note.

(11) *C. sudanensis* nomen novum: *Corynebacterium* capable of growing below 25° C. Producing on Loeffler's blood serum colonies closely resembling those of *C. diphtheriæ*. On potato forming dew-drop

DIAGNOSTIC TABLE.

Genus *Corynebacterium* Lehmann and Neumann 1896 sensû stricto.

Group 3. The Klebs-Loeffler Group.

Subgroup A. Diphtheriæ.

Culture below 25° C.

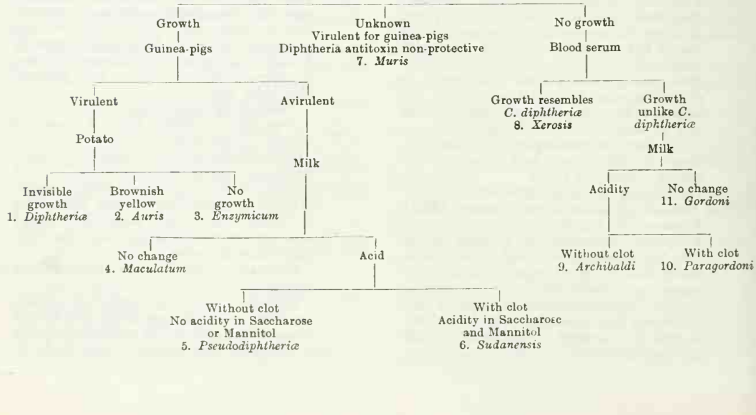

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Fig. 2.

Fig. 1.

Fig. 3.

Fig. 4.

Fig. 5.

Fig. 6.

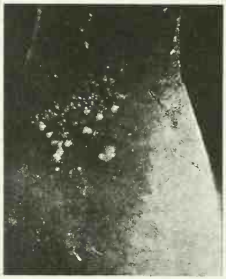

Fig. 8.

Fig. 7.

To illustrate paper, "Some Sudanese Diphtheroids," by ALBERT J. CHALMERS, M.D., F.R.C.S., D.P.H., and NORMAN MACDONALD.

colonies which become white. Giving rise to acidity in glucose, lævulose, galactose, rhamnose, salicin, dulcitol and mannitol, but not in glycerol, erythrol or adonitol.

Aviruleut for guinea-pigs.

Originally found in inflamed tonsils in the Anglo-Egyptian Sudan.

Remarks: This variety is created for the forms described above as Strains I and III, the similarity of which to one another has already been pointed out.

Having now completed the definitions of the organisms known to us, which we have classified under Subgroup A, we will give a differential diagnostic table which enables them to be easily differentiated from one another.

Summary: We have endeavoured in this communication to aid the diagnosis of true diphtheria in the Tropics by drawing attention to a number of diphtheroids which, more or less, morphologically resemble the Klebs-Loeffler organism, i.e., *Corynebacterium diphtheriæ* (Klebs 1883).

(2) We have sorted these diphtheroids into those which belong to Chester's *Mycobacteriaceæ* and those which do not; and again into those which belong to Lehmann and Neumann's genus *Corynebacterium* sensû stricto and those which do not.

(3) We have divided the forms included under this generic name into four groups of which the third is the Klebs-Loeffler group.

(4) This group we have subdivided into two subgroups of which one contains forms morphologically resembling the Klebs-Loeffler bacillus and we have defined what we mean by the term "morphologically resembling."

(5) Into this group we have brought eleven organisms of which seven have been previously named, three have been previously described but not named, and one which is entirely new. All these forms we have defined to the best of our ability.

(6) We have brought forward a scheme whereby these eleven forms may be recognized from one another.

(7) We have demonstrated the presence of *Corynebacterium pseudodiphtheriæ* Eberson 1918 in the Sudan and also of a new organism to which we give the name *Corynebacterium sudanensis* Chalmers and Macdonald 1919. We have also pointed out that the xerosis bacillus described by Archibald and subsequently found by us is different from Kuschbert and Neisser's organism and have named it *C. archibaldi*.

Acknowledgments: We desire, gratefully, to acknowledge kindness received during the preparation of this note from Major Archibald, D.S.O., R.A.M.C., Dr. Malouf of Khartoum, and Dr. Soghayer of Khartoum North.

Addendum.

In order to complete the differentiation of the organisms known to us which belong to the genus *Corynebacterium* as defined above we add a diagnostic table of the forms already mentioned as belonging to Subgroup B.

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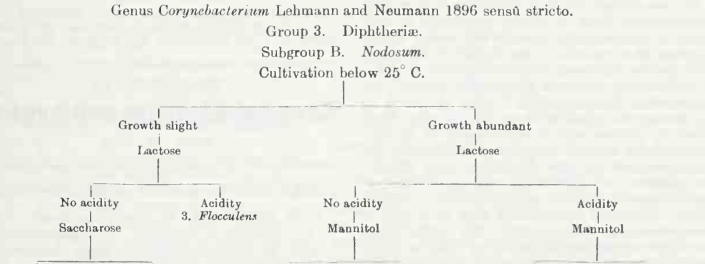
Genus *Corynebacterium* Lehmann and Neumann 1896 sensû stricto.

Group 3. Diphtheriæ.

Subgroup B. *Nodosum.*

Cultivation below 25° C.



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ILLUSTRATIONS.

FIG. 1.—*Nocardia sp.* ? from a culture obtained from the throat of a native of the Sudan. Stained by Neisser's method. Note the resemblance to a diphtheroid. Photomicrograph. × 800 diameters.

FIG. 2.—Stereoscopic photograph of a native of the Sudan suffering from conjunctivitis and xerosis. Note the white patch in the eye, and the watery exudation escaping from the inner canthus. These photographs can be removed from the plate by cutting along the line AA, and are arranged for the ordinary stereoscope. Photographs. Reduced.

FIG. 3.—*Corynebacterium archibaldi* Chalmers and Macdonald 1919. Direct smear from the conjunctiva stained by Gram's method. Photomicrograph. × 1,000 diameters.

FIG. 4.—*Corynebacterium sudanensis* Chalmers and Macdonald 1919. Strain I. Direct smear showing Balfour's granules. Photomicrograph. × 1,000 diameters.

FIG. 5.—*Corynebacterium sudanensis*. Strain I. Diphtheroids from a culture on Loeffler's blood serum stained with tolnidin blue. Photomicrograph. × 1,600 diameters.

FIG. 6.—*Corynebacterium pseudodiphtheriæ* Eberson 1918. Strain II. Diphtheroids from a culture on Loeffler's blood serum. Stained by Neisser's method. Photomicrograph. × 1,600 diameters.

FIG. 7.—*Corynebacterium sudanensis*. Strain III. Diphtheroids from a culture on Loeffler's blood serum stained by teluidin blue. Photomicrograph. × 1,600 diameters.

FIG. 8.—*Corynebacterium sudanensis*. Strain III. Diphtheroids. Culture on potato for nine days at 37° C. Photograph, × 4 diameters.

Study on the Diffusibility of the Virus of Rabies (Remlinger, P., in the *Annales de L'Institut Pasteur*, vol. xxxiii, No. 1, pp. 28-52, + 3 tables, + plates. Paris, January, 1919).—The author, after relating his experiments on the diffusibility of the rabies virus, notes that this possesses a group of properties whose presence together is paradoxical: at the same time filtrable, diffusible and capable of reproducing itself, it should apparently be considered as intermediary between the visible microorganisms that are the lower limits of the plant world and the diastases, colloidal substances which are at the upper limits of unorganized bodies. He suggests the hypothesis that forcing the virus to pass through the pores of a very fine porcelain filter suffices to produce such a modification in its constitution as to lose the property of reproducing the disease, without its other properties being altered. This procedure probably transforms the ultra microscopic organism which produces rabies into a colloid. The rabic toxin would thus be a sort of allotropic state of the organism. The author states that this is apparently applicable to other so-called "invisible" or "ultra-microscopic" organisms and "filtrable viruses."

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THE JOURNAL OF

Tropical Medicine and Hygiene

APRIL 15, 1920.

DEATH OF DR. ALBERT JOHN CHALMERS.

IT is our sad duty to record the death of Dr. A. J. Chalmers at Calcutta. A telegram reached London as we were going to press that he was dead, no previous warning of illness having been received. The shock to his many professional

friends and intimate acquaintances was intense, and throughout the world of tropical medicine the irreparable loss will be keenly felt. Dr. Chalmers was actually on his way home from the Sudan, where for many years he worked so assiduously as the Director of the Wellcome Tropical Research Laboratories in Khartoum. He had already resigned his post as Director of these laboratories, where, as successor to Dr. Andrew Balfour, he had carried on and maintained the high standard of work set him by his famous predecessor. Only a few weeks ago the writer received a letter from Dr. Chalmers, in which he sketched his plan of study for the twelve months commencing March, 1920. He regarded this as a year's holiday. But a holiday to one of Dr Chalmers's temperament meant freedom to follow his bent in that field of research and study which most fascinated him, and one along which tropical medicine would be best served and advanced.

From Khartoum to Calcutta was not a change which a medical practitioner would advise for a man already run down in health and strength from close and unremitting study in a Khartonm laboratory. But with Dr. Chalmers neither climate nor work counted; work was his pleasure and the study of disease had become a passion with him. The telegraphic news of his illness and death, which is all we have yet received, briefly state that his illness was sudden and the cause of his death was an acute infective hepatitis.

Born in 1870, he had but reached his fiftieth year, when in the heyday of knowledge, enthusiasm and reputation he passed away. His parents hailed from Aberdeenshire, he was a "child of the manse"; his father was the late Rev. James Chalmers, M.A., Aberdeen, and his mother was a daughter of the late Captain Martin, of Peterhead. Their son saw the light of day at Manchester; he was educated at the Manchester Grammar School, and subsequently at the University Colleges of Liverpool and London. He graduated in medicine with distinction at the Victoria University, Manchester, in 1893; became an F.R.C.S.Eng. in 1895, and subsequently was granted the M.D.Liverpool in 1905, and took the D.P.H.Cambridge in the same year. He joined the Colonial Civil Service, and whilst on the West Coast of Africa he served in 1900 with the Ashanti Field Force, for which he was mentioned in despatches and granted the medal and clasp. In Ceylon he joined the Volunteer Medical Corps, in which he held the rank of major, and came to London in 1911 with the Ceylon Coronation contingent.

In Ceylon he became acquainted with Dr. Aldo Castellani, and from this auspicious meeting sprang an intimate co-operation in work and thought which gave us that storehouse of knowledge, namely, the "Manual of Tropical Medicine." This meeting of men, each endowed with genius of a high order in varied and various fields of research, in the practice of medicine and in literary and scientific ability, bore the happiest results. The attachment of the two men was as that of brothers, for the writer has had it from the lips of both that they never had even a disagreement, and each declared to the writer in private that he regarded the other as a brother. Each recognized the other's worth and jealousy was, as it ever is amongst really great men, unknown.

In Ceylon Dr. Chalmers held the official position of Lecturer on Pathology and Animal Parasitology in the Medical College of Colombo, and did much to maintain and improve the status of the College in which he taught.

When Dr. Andrew Balfour left Khartoum, where for years he had, as Director of the Wellcome Tropical Research Laboratories, established a world-wide fame for these laboratories and for himself, Dr. Chalmers was chosen as his successor. Much speculation in the scientific world was afoot, when it was known that he (Dr. Balfour) was about to retire from Khartoum to become Director-in-Chief Wellcome Bureau of Scientific Research in London, as to who would be his successor. The men worthy of such a distinction could be counted on the fingers of one hand, but two wise heads such as H. S. Wellcome, Esq., and Dr. Balfour were not likely to make a mistake and Dr. Chalmers was selected. As they honoured him so did he justify their wisdom, for never was a trust more nobly or more brilliantly fulfilled. The spirit of the great Gordon it would seem hovers around the College in Khartoum which bears his name, and generates in men the self-sacrifice, the devotion and the ennobling qualities which have rendered Gordon's name immortal amongst men. Balfour and Chalmers have each trod the paths along which Gordon attained reverence and fame, and we respect and cherish them accordingly.

In this appreciation let us not forget the man who founded the institution in which Balfour and Chalmers have had their opportunities and won their fame. It was a fortunate day for the Sudan and for science that Mr H. S. Wellcome made his way to Khartoum. The founder of the great commercial house with which his name is associated is endowed with a mind and spirit far in advance of the daily commercial task which is the portion of most men. His researches in regard to the pharmacology and medical art of the Ancients in many countries led him to the cradle of medicine, namely Egypt; and he followed his inquiries far beyond Lower Egypt to Upper Egypt and the Sudan. There, no doubt as a tribute to the magic influence of Gordon's spirit, as well as his innate desire to forward the science of tropical medicine, and perhaps as an appreciation of the country of his adoption for the welcome it had extended to him, he founded and endowed the Wellcome Research Laboratories in Gordon's College, Khartoum. The men he chose as directors were of the highest order and the Sudan and the scientific world generally have benefited to an incalculable degree. The same is to be said of the more recently formed Wellcome Bureau of Scien-

tific Research in London; both are a monument to Mr. H. S. Wellcome and we thank him for the encouragement he has given to tropical medical research, and for granting men of the highest scientific attainments opportunities of study which would have been denied to them otherwise and the world would have been the loser in consequence. He has cherished and encouraged such men as Balfour, Chalmers, Wenyon, Sambon and many others who have served to place the tropical researches of Britain on the highest pinnacle of fame. The work of Dr. Chalmers in the Sudan has been of the most advanced order; original, important, and convincing in its thoroughness, he has left a record which is at once marvellous in its scope and in its quality. He is cut off at an age which was maturing towards full fruition and by his death we are deprived of the full benefits which his powers of observation and research justified us in hoping for and expecting. He had many projects sketched out for his future work, each of them of wide interest and culculated to benefit mankind in the fight against disease. We can only regret he was not spared to science, but his example will inspire others as it has already inspired and attracted other observers to his laboratories in Khartoum. His many published papers in conjunction with associates in his laboratory shows that he helped and encouraged them, nor sought to detract from the work done by them in the laboratory by publishing the papers in his own name, as many a man of lesser attainments might have been tempted to do.

The JOURNAL OF TROPICAL MEDICINE AND HYGIENE has had the honour and privilege of publishing many of his papers. He has been a loyal supporter of the journal and greatly added to its reputation and circulation. The writer hoped that when he came to settle in London he would take up the editorship of the journal which he has benefited to so great an extent; but from this, as in the larger field of science and research, Dr. Chalmers has passed away, regretted by friends, mourned as an irremediable loss to the world of science, loved by all who knew him for his sterling qualities. We extend our sympathy to his widow —his constant companion who dared the climates of many countries with untoward reputations, and who by her care and wisdom staved off the effects of many ailments from a husband whose memory we will cherish and whose qualities we respect and admire.

Treatment of Influenza Pneumonia by Serum from Convalescent Patients (R. Redden, *Boston Med. and Surg. Journ.*, December 11, 1919).—From an experience in the treatment of over 250 cases of influenza pneumonia by the use of pooled serum from convalescent patients, the author concludes that both in hospital and private practice the course of the disease is shortened, the death-rate halved in serious cases, and reduced three-fourths in hospital cases seen early.

Annotations.

Malaria Hemiplegia in an Infant (Spolverini, *Il Policlinico*, December 21, 1919).—The author reports a case of hemiplegia in an infant. The microscopical examination of the blood revealed presence of malaria parasites, and quinine cured the condition.

Acctonuria from Fatigue (Azzi, *Riforma Medica*, November 8, 1919).—The author has noted a large increase in the elimination of acetone bodies after taking severe exertion. He carried out the experiments on himself during a period of mountain climbing. The severe acetonuria persisted as long as the sensation of fatigue was present; it disappeared as soon as he felt quite rested.

Emetine Urticaria (Savignac, *Paris Médical*, January 10, 1920).—The author describes a case of urticarial eruption recurring in a dysenteric patient after each course of emetine injections. The pomphi at first appeared in the region of the injections, but later the eruption became general. The urine was found to contain emetine up to three months after the last injection.

A Polyvalent Vaccine in the Treatment of Bacillary Dysentery in East Africa (W. H. Kauntze, *Journal of Hygiene*, February, 1920).—Dysentery was the principal cause of mortality and invaliding amongst the porters of the Military Labour Bureau in the early days of the East African Campaign. At first the general opinion was that the disease was of the amœbic type, but Dr. Pirie, Government Pathologist at Nairobi, clearly demonstrated that the great majority of the cases were of bacterial origin. The author confirmed Dr. Pirie's observations, and suggested preparing a curative vaccine which was sterilized by adding 0·4 per cent. carbolic acid and not by heat, in order to diminish its toxicity. The earliest vaccine tried was a mixture of *B. shiga and B. flexner* in equal parts, and the initial dose was 5 million, but later the vaccine was made more polyvalent, consisting of *Shiga* three strains, *Flexner* two strains, and *Morgan* three strains. The results were on the whole extremely satisfactory.

[Vaccines in the treatment of dysentery were used first in 1906 by Greig and Castellani, the latter observer being the first to sterilize such vaccines by adding 0·5 per cent. carbolic acid without heating.]

Unusual Forms of Dysentery (George C. Low, *British Medical Journal*, February 21, 1920).—The author describes several interesting cases of dysenteric diarrhœa of unusual origin. In one of the cases a syphilitic infection was the cause of the

condition, in another tubercular infection. Several cases are quoted of schistosomiasis dysentery. Dysenteric symptoms may also be caused by *Paragonimus westermanii*, *Heterophyes heterophycs* and by *Ankylostoma duodenalis*.

Tetany in a Case of Sprue (A. L. Barach and H. A. Murray, *Journ. of the Amer. Med. Association*, vol. lxxiv, No. 12, March 20, 1920).—The authors describe an interesting case of sprue with tetany. The upper extremities were spastic, drawn up, and flexed at the elbows, flexed and rotated outwards at the wrists. The fingers were flexed at the metacarpophalangeal joints, and the interphalangeal joints were extended. The lower extremities were also spastic, with flexion at the knee and extension at the ankles. A very complete analysis of the blood showed a decrease in the calcium concentration of the serum, but calcium lactate infusions did not relieve the condition. The case ended fatally.

Ulcerating Granuloma of Pudenda (H. Goodman, *Archives of Dermatology and Syphilology*, Chicago, February, 1920).—The author reports four cases of the condition, in three of which *Calimatobaeterium granulomatis* was demonstrated. In the fourth case spirochætes were found. Mercury and salvarsan were ineffective. Antimony was not given for a sufficiently long time to enable one to come to any definite conclusion as regards its efficacy.

Fat-soluble Vitamine Content of Green Plant Tissues (H. Steenbock and E. G. Gross, *Journal of Biological Chemistry*, February, 1920).—According to the authors' interesting experiments, it would appear that of the plant structures the leaves are usually richest in the fat-soluble vitamine, while the roots contain it in lesser amount, and the grains in the least.

Thermostability of Fat-soluble Vitamines in Plant Materials (H. Steenbock and E. W. Boutwell, *Journal of Biological Chemistry*, February, 1920).—The authors' investigation shows that autoclaving for three hours at 15 lb. pressure does not destroy the fat-soluble vitamines found in yellow maize, carrots and sweet potatoes. The fat-soluble vitamine as found in plants is therefore comparatively thermostable.

The Antagonism between Epinephrin and Quinine.—Drs. A. Clerc and G. Pezzi recently communicated to the Académie des Sciences the results of their researches, which go to prove that there is an antagonism between the action of quinine and that of epinephrin, but that nevertheless there is no absolute opposition in the different modes of action of the two substances. There is complete antagonism in the cells of the bulbar centre of the pneumogastric nerve, for epinephrin stimulates and quinine paralyses this nerve. There is also antagonism with respect to cardiac action, epinephrin having a stimulating and accelerative effect and quinine acting as an inhibitor and depressant. There is even antagonism in regard to arterial pressure; epinephrin produces hypertension and quinine hypotension. But epinephrin causes hypertension by a cardiac and vascular action combined, whereas quinine produces hypotension by overcoming the vasoconstrictive action common to the two substances, although in a different degree. Even allowing for the vasoconstrictive mode of action which is common to the two substances, the antagonism between them is nevertheless noteworthy. While epinephrin acts as a stimulant of the sympathetic nervous system, quinine must be accorded a sedative action, which makes possible new therapeutic applications.

Mouse Oxyuride, Syphacia Onvelata in Man.—W. A. Riley (*Journ. Parasitology*, December) found in the fæces of an American-Bohemian child, one of a family of five, all of whom were heavily infested by the worm. The food of the child and of others of the family had been grossly contaminated by mice or rats. This accounts for the infestation by one of the commonest nematode parasites of these rodents. Incidentally, it furnishes circumstantial evidence in favour of the view that *Hymenolepis nana* of man and *Hymenolepis murina* of rodents are one and the same.

Sanitary Victory over Yellow Fever.—The epidemic which began about the middle of last year, in the northern part of Peru, has just been officially declared as having come to an end. An active sanitary campaign, directed at first by Mr. H. Hanson and afterwards by Drs. Gastiaburú, Quirós and Almenara, deserves the credit for its eradication. Some interesting studies have been made about *Leptospira icteroides*, which may throw new light on the etiology of this disease. Cultures of *Leptospira icteroides* have been made at the hygienic laboratory of Lima. The number of cases during the epidemic amounted to more than 200, with a mortality rate of 40 per cent.

Filariasis (*Journ. Amer. Med. Assoc.*, February 7).—R. G. Lee (*Crónica méd.-quir. de la Habana* 44:15 [January] 1918) reported excellent results in eighteen cases of filarial hæmaturia treated with potassium iodide. Leonard Rogers (*Lancet*, 2:604 [October 4] 1919) found repeated injections of safe doses of sodium antimonyl tartrate, 1:50 solution, produced diminution of filarial embryos in the peripheral blood. Jeanselme (*Bull. Acad. de méd.* 81:156 [February 4] 1919) and Deschamps (*Bull. Acad. de méd.* 81:655 [May 20] 1919) have re-

ported radical cures after intravenous injections of arsphenamin. Special treatment will naturally depend on the manifestations in a given case. Lymphangitis with fever requires rest, elevation of the affected part, ice or cooling lotions or warm fomentations locally, opium or morphine when necessary to relieve pain, mild aperients, and if tension is great, pricking or scarifying of the swollen area. Lymph scrotum should be kept scrupulously clean, powdered, suspended and protected against irritation or injury. Chyluria demands absolute rest, elevation of pelvis, restriction of fluid and food—especially fats—and gentle purgation. In elephantiasis of extremities, elastic bandages, massage and elevation of the part are indicated. Any or all of these conditions may necessitate surgical interference for the relief of an incapacitating amount of discomfort or frequent inflammatory attacks with fever. *References:* Manson, Sir Patrick: "Tropical Diseases," Ed. 5, pp. xxiv + 937, New York, William Wood and Co., 1914. Castellani, Aldo, and Chalmers, A. J.: "Manual of Tropical Medicine," Ed. 2, New York, William Wood and Co, 1913. Stitt, E. R.: "The Diagnosis and Treatment of Tropical Diseases," Ed. 2, pp. xiii + 534, Philadelphia, P. Blakiston's Son and Co., 1917.

Typhus Fever.—In Esthonia 15,000 cases have been reported. In eastern Galicia there are more than 100,000 cases of the disease, with a mortality of about 10 per cent. At Reval there are 4,600 cases of typhus among Russian soldiers at Narva, 3,500 cases at Wesenberg, and 2,000 cases at Ziegelkoppel.

Current Literature.

THE JOURNAL OF THE ROYAL ARMY MEDICAL CORPS. Vol. XXXIV, No. 3, March, 1920.

Dysentery and Enteric Disease in Mesopotamia from the Laboratory Standpoint (J. C. G. Ledingham).—For laboratory purposes, dysentery and diarrhœa cases were divided into two groups according to the naked-eye and microscopical appearances of the motion, viz.: (1) B. and M. group (i.e., blood and mucus), and (2) non-B. and M. group. The laboratory returns for the month yielded the percentage figure for the presence of *E. histolytica* in B. and M. cases and non-B. and M. cases, and also for the successful isolation of *Bacillus dysenteriæ* in cases submitted to cultural examination.

The author's view is that in an epidemic season, practically all the non-amœbic acute dysenteries may fairly accurately be regarded as bacillary. The test of the predominance of *B. dysenteriæ* during an epidemic period must be a fall in the percentage of *E. histolytica* from that reached in the month prior to the epidemic. If the amœbic percentage falls the excess of cases must be due to bacillary infections. If the amœbic percentage remains fairly constant or even rises somewhat, the epidemic may be considered as the resultant of two forces, one of which, however, will always be more prominent than the other, in view of the fact that *E. histolytica* precentages in B. and M. cases have only in exceptional circumstances exceeded 50 per cent.

An Anti-malaria Campaign in Palestine (E. P. Sewell and A. S. M. Macgregor).—The authors made the following observations:—

(1) Adults of *A. bifurcatus* were found sheltering in wells in mid-winter, and when disturbed bit freely. Larvæ of this species were found at the same time in the wells.

(2) An outbreak of subtertian malaria occurred among troops billeted in close proximity to these wells in December and January.

(3) In open waters anopheline larvæ were not found until April 10, and breeding was not free until the end of May.

(4) Swarms of *A. maculipennis* appeared in the vicinity of the Bahret Katurieh at the beginning of June, when breeding in the marsh was scanty, and a rapid increase of malaria followed. It seemed probable that these mosquitoes had hibernated in the tunnels and caves.

(5) As a result of extensive draining of marshes and canalization of rivers, larvæ and adult mosquitoes were reduced to a minimum by August, when, under natural conditions, it might have been expected that their numbers would have been rising to a maximum.

(6) The incidence of malaria among the troops fell coincidently with the disappearance of anophelines.

(7) The total loss of men to the Army Corps from malaria was only about 10 per cent. of the strength during the twenty-one weeks under consideration, with the result that the troops were able during the autumn to engage in a most arduous campaign which ended in the annihilation of the Turkish Army and the cessation of hostilities.

Capsulated Mucoid Forms of Paratyphoid and Dysentery Bacilli (William Fetcher).—The author has isolated capsulated bacilli forming slimy mucoid colonies from the excreta of two chronic carriers of *B. paratyphosus* B and one case of acute infection with *B. aertrycke*. These organisms were motile, Gram-negative, did not produce indol, formed acid and then alkali in milk, and had the same fermentation reactions as *B. paratyphosus* B, but were agglutinated only in low dilutions by paratyphoid immune sera.

Sphenoidal Empyema and Epidemic Cerebrospinal Fever (Dennis Embleton).—In thirty-four necropsies on persons dying from cerebrospinal fever, empyema of the sphenoidal sinus was observed thirty-two times. In forty-seven completely recovered cases of cerebrospinal fever no sphenoidal empyemata were present.

Annals of Tropical Medicine and Parasitology. Vol. XIII, No. 4, March, 1920.

The Mechanism of the Spontaneous Elimination of Yellow Fever from Endemic Centres (H. R. Carter).—The author quotes several instances proving that spontaneous disappearance of yellow fever is not rare. In the absence of adult immigration and of inter-travel, this is expected to take place in a large proportion of towns, and after this, even when there are influxes of strangers, outbreaks in such towns do not occur, unless they are in communication with some infected focus. These outbreaks then are re-infections and not recrudescences of "latent" or "larval" yellow fever.

The Metabolism of White Races living in the Tropics. Influence of External Temperature and Rate of Cooling upon the Respiratory Metabolism (W. T. Young).—The author has observed that during the hot season there is greater metabolism than during the cool season. With tropical heat the metabolism is at a high level on account of the increase in body temperature produced by even slight exertion, and which decreases only very gradually after the exertion has ceased. Cold may also increase the metabolism but by producing shivering and so increasing the muscular activity.

The Hypopus of Carpoglyphus anonymus Haller (Hubert M. Morris).—Detailed zoological description of the hypopus of *Carpoglyphus anonymus*. The mite itself was present in large numbers in a quantity of dry figs received by the author for examination from the Port Sanitary Authority of Liverpool.

Xerophthalmia in a native of the Gold Coast (J. W. S. Macfie).—The author comes to the following conclusions: (1) Epithelial Xerosis of the conjunctiva is not uncommon in natives of West Africa; (2) Attempts to reproduce the disease in animals by means of a bacillus isolated from a case (*B. xerosis*) were unsuccessful.

An Observation on the Effect of Malaria in Leukæmia (J. W. S. Macfie).—A great reduction in the number of leucocytes was noticed when malaria parasites appeared in the blood. Tartar emetic did not induce any improvement in this case of leukæmia, nor did it prevent the development of an attack of malaria (*P. falciparum*).

Tropical Australia and its Settlements (A. Breinl and W. J. Young). The hot summer militates against permanent settlement, especially since the housing, lack of water, &c., are causes of great discomfort. One cannot expect a white population to thrive in the tropics, unless all possible means be adopted to alleviate climatic conditions.

The Experimental Infection in England of Anopheles plumbeus Stephens and *Anopheles bifurcatus* L. *with Plasmodium vivax* (B. Blacklock and Henry F. Carter).—The authors have been able to infect laboratory bred *A. plumbeus* with *Plasmodium vivax*. At 28° C. infections of the gut and salivary glands were obtained; at room temperature gut infection only was obtained. As regards *Anopheles bifurcatus* the authors have proved that in England the native form of this mosquito is capable of being infected with malaria at 28° C.

Observation on Anopheles plumbeus Stephens (B. Blacklock and Henry F. Carter).—The authors have found that *A. plumbeus* is not uncommon in the Liverpool area and that it occurs widely distributed round the city and within the four-mile limit. They are of opinion that it may be of importance as a natural carrier of malaria especially as its breeding places frequently occur in isolated trees often in proximity of a house.

Description of the Male Genital Armatures of the British Anopheline Mosquitoes (Henry F. Carter).—Detailed descriptions of the male genital armatures of *Anopheles maculipennis* Meig., *Anopheles bifurcatus, L., and Anopheles* (*Cœlodiazesis*) *plumbeus* Stephens.

On Human Trypanosomiasis in Peru (Warrington Yorke).—The author suggests the name *Trypanosoma escomeli* for the trypanosome found by Escomel in the inhabitants of the Eastern Peruvian forests.

Abstract.

ETIOLOGY OF YELLOW FEVER: SUMMARY AND CONCLUSIONS.[1]

By Hideyo Noguchi.

It has been previously reported that a filterable micro-organism belonging to the genus Leptospira has been recovered from the blood or organs of human beings suffering from the disease known as yellow fever in Guayaquil, and that the organism, which has been termed *Leptospira icteroides*, induces in certain experimental animals the characteristic symptoms and lesions observed in the patients from whom it was isolated. It has also been previously shown that the serum from patients recovering from an attack of yellow fever in Guayaquil had the power to agglutinate and dissolve the organism when introduced into the peritoneal cavity of a normal guinea-pig (Pfeiffer phenomenon). Moreover, the guinea-pigs which had once been inoculated with the blood of yellow fever patients without succumbing to the infection, notwithstanding the fact that they had shown a definite febrile reaction after four to five days, were found to be refractory to a subsequent inoculation of a culture of *Leptospira icteroides*. All these observations pointed to the possible relation of this organism to the disease known as yellow fever in Guayaquil. The demonstration of the filterability of the organism and the

[1] Abstracted from the *Journal of Experimental Medicine*, vol. xxxi, No. 2, February 1, 1920.

transmission of the infection with the same organism by *Stegomyia calopus* have further strengthened the probable etiological significance of the organism in yellow fever.

It was by no means a simple problem to determine the relation existing between *Leptospira icteroides* and *Leptospira icterohæmorrhagiæ*. An experiment reported in a previous paper seemed to justify the view that the two leptospiras are closely related, but not identical, yet it was necessary to exhaust various other modes of differentiation before the distinction between them was firmly established. The present paper continues this phase of the inquiry in further detail.

There have been taken up here the phenomena of agglutination, the reaction of Pfeiffer, complement fixation, the protective properties of various monovalent and polyvalent immune sera and active immunity. As the result of experiments in connection with these immunity phenomena the following data are presented.

Monovalent immune sera prepared by several successive injections in an animal naturally refractory to *Leptospora icteroides* possess the power to agglutinate in vitro not only the homologous strains, but also all other strains of icteroides tested. On the other hand, a slight effect, or none at all, has been observed when these immune sera have been mixed in vitro with various strains of *Leptospira icterohæmorrhagiæ*. A similar relation exists between the monovalent anti-icterohæmorrhagiæ sera and the various strains of *Leptospira icteroides;* that is, there is a slight agglutinating effect in some instances upon the icteroides strains, but it is never so strong as that occurring in tests against the icterohæmorrhagiæ strains. The Pfeiffer reaction gave a sharper diafferentiation between the two groups, for in most instances the phenomenon was specific for the group. There were occasionally doubtful reactions, but not enough to warrant a confusion of the two groups.

Polyvalent immune sera, one specific for icteroides and the other for icterohæmorrhagiæ, showed a higher titre of neutralizing power for the cultures of the homologous groups. It was found, however, that the action of the sera is by no means absolutely specific, because the injection of a sufficient amount of the anti-icteroides serum apparently prevented a fatal outcome in a guinea-pig inoculated with multiple minimum lethal doses of a culture of *Leptospira icterohæmorrhagiæ*, and vice versa. The specificity of the serum was demonstrated only when it was used in smaller quantities.

More or less specificity was shown by the complement fixation reaction, but it was not absolute. Weak fixation occurred when the anti-icteroides serum was mixed with one or the other of the icterohæmorrhagiæ strains and vice versa, and strong fixation occurred only when the anti-serum was mixed with one of the icteroides strains. The question naturally arises whether or not this apparent specificity is due to the homology of the serum and not altogether to a difference in genus of the strains. In other words, it is justifiable to question whether all these variations in the degree of intensity of the reaction are not due to strain variations of the same genus. This question is not finally settled by the present investigation, in which only four icteroides and nine icterohæmorrhagiæ strains have been carefully studied. Nevertheless, on the basis of the findings with these thirteen strains, it seems probable that *Leptospira icteroides* and *Leptospira icterohæmorrhagiæ* are closely allied but are nevertheless distinct in their immunological reactions. Perhaps the difference between the two may amount to that between sub-species or races. It has been pointed out earlier that the pathogenicity of the two is also distinct, inasmuch as icteroides produces chiefly icterus and nephritis and icterohæmorrhagiæ hemorrhage and nephritis, the icterus being less than the hæmorrhage more prominent in the evolution of the latter infection.

In the study of active immunity—exclusive of vaccination—difficulty has been experienced in the evaluation of the results, owing to the existence of natural resistance to infection among guinea-pigs. A guinea-pig may recover from the inoculation of *Leptospira icteroides* and then resist a subsequent inoculation with a virulent strain of *Leptospira icterohæmorrhagiæ*, a condition simulating that brought about by the identity of the two organisms. However, the refractoriness of such an animal to icterohæmorrhagiæ may be due to its natural immunity to it. In the present study, therefore, only those guinea-pigs were selected which had reacted typically—though in mild degree—to the icteroides infection, in order to determine whether they were subsequently immune to the inoculation of icterohæmorrhagiæ. Indeed, by this mode of experimentation it was found that the guinea-pigs which had once passed through an attack of the icteroides infection were absolutely immune to a second infection with the same organism but reacted severely and sometimes fatally to a later inoculation of icterohæmorrhagiæ. Although there were a number of instances in which a previous infection with icteroides did not confer any perceptible immunity upon the guinea-pigs against icterohæmorrhagiæ, another group of guinea-pigs showed a considerable resistance to the icterohæmorrhagiæ infection as compared with those which had never been inoculated with icteroides. There is not much doubt, therefore, that an icteroides attack brings about, in some instances at least, a certain degree of resistance to the icterohæmorrhagiæ infection. Hence the study of the phenomena of active immunity strongly indicates that icteroides is closely related immunologically to icterohæmorrhagiæ.

Medical News.

The address of the Wellcome Bureau of Scientific Research will, on and after April 15 next, be 25, 26 and 27, Endsleigh Gardens, Gordon Square, London, N.W.1.

Original Communications.

MILROY LECTURES ON THE HIGHER FUNGI IN RELATION TO HUMAN PATHOLOGY.[1]

By Aldo Castellani, C.M.G., M.D., M.R.C.P.,
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Mr. President, Censors and Fellows of tbe College: I beg, first of all, to express to you my deep appreciation of the honour I have received in being asked to deliver the Milroy Lectures for this year. It is an honour I shall always very greatly value.

As subject of my tbree lectures I have taken the higher fungi in relation to human pathology. The study of bacteria or lower fungi is so engrossing and has given results of such magnitude, that there has been perhaps a tendency hitherto to overlook the importance, from a medical point of view, of vegetal organisms higher than bacteria. There is little doubt, however, in my humble opinion, that further investigation will tend to increase the importance of these organisms in the same manner that the great medical importance of animal parasites higher than protozoa has already been recognized.

In the first lecture I propose touching briefly on the subject of fungi in general, on their morphological characters and classification and on their biological properties. In the second and third lectures I propose studying them in relation to human disease, discussing briefly, and giving a description of some of the less known affections of mycological origin in the investigation of which I happen to have taken a part.

Historical.

Mycology, the branch of botany which deals with the higher fungi, may be said to have begun in the days of Charles II, when Hook constructed a magnifying lens, and with it examined the yellow spots so often found on the leaves of the Damascus rose. He saw that these spots were caused by certain filamentous fungi, of which he gave a detailed description and left remarkably good drawings. He believed like many other observers after him that fungi arose from spontaneous generation, especially in decaying matter.

About the end of the same century (1686), Malpighi in his writings several times referred to parasitic fungi, especially to fungi of the type Mucedo. In 1753, Linnaeus, in his famous book "De Species Plantarum" collected all that was known at the time on the subject, and named a large number of species. After Linnaeus many botanists carried out investigations on fungi: it suffices to mention the names of Persoon, Link, Kützing. It is interesting to note, however, that fungi parasitic of man did not, apparently, attract attention until the beginning of the last century. The first fungus of importance found in man was the thrush-fungus, by Langenbeck, in 1839. This author discovered the fungus examining microscopically the white patches of thrush he found at the autopsy of a case of typhoid, in the oral mucosa, the pharynx and the whole of the intestine. He believed at first that the fungus was the cause not only of the white patches, but of the typhoid infection from which the patient had died.

Berg in 1842 gave a good description of the organism, and in 1843 Charles Robin made a complete investigation of it and called it *Oidium albicans* Charles Robin. Robin wrote also a book on mycology, which has remained classic: "Histoire Naturelle des Végétaux Parasites qui croissent sur l'Homme et sur les Animaux Vivants," J. B. Baillière, Paris, 1853. It took a long time, however, for the idea that thrush was a mycological affection to be generally accepted; even many years after Charles Robin's classic work numbers of physicians did not believe in it. In the most popular text book of pathology of the fifties and sixties of last century, one reads that the thrush patches are the result of a morbid secretion of the oral mucosa, and the author adds "A mycologist, however, has brought forward the peculiar idea that such patches are composed of a mass of vegetable organisms."

In the same year in which the thrush-fungus was found (1839), Schoenleín discovered the fungus causing favus: this organism a little later was further investigated by Lebert, who called it *Oidium schoenleini* and subsequently by Remack, who named it *Achorion schoenleini*.

In 1844 Gruby described the fungi found in ringworm and made a distinction between ringworm due to a large spore fungus and ringworm due to a small spore fungus, a distinction which was ridiculed at the time and completely forgotten later, until many years after, Sabouraud made the same distinction, and very honourably called attention to Gruby's forgotten work.

In 1846 Eichstedt discovered the fungus of Pityriasis Versicolor. Interest in the study of the higher micro-fungi continued to be great until the seventies and eighties of last century when the epoch-making discoveries of Pasteur and Koch brought bacteriology to the front, and mycology was relegated to the background. Interest in mycology slightly revived in the last years of the century, this being principally due to the work of Sabouraud—and during the last twenty years, slowly but surely, this branch of knowledge has grown in importance.

General Remarks and Classification.

As is well known the Vegetal Kingdom is usually divided into four large groups or *phyla*: the *Thallophyta*, the *Bryophyta*, the *Pteridophyta* and the *Phanerogamæ* or Flowering Plants. The Thallophyta may be defined as being vegetal organisms with a cellular structure, which is usually little

[1] Delivered before the Royal College of Physicians of London.

differentiated, and reproducing either asexually by division and by spore formation—or sexually, after conjugation, by oösporés. These organisms may be separated into two classes:—

(1) Those with chromatophores and chlorophyl—*Algæ* Roth 1797.

(2) Without chromatophores and chlorophyl—*Fungaceæ* Linnæus 1737.

The Algæ are generally subdivided into the *Cyanophyceæ* (Blue-green Algæ) the *Chlorophyceæ* (Green Algæ) and the *Schizomycetaceæ*, bacteria *sensu lato* (or lower fungi). It must be noted, however, that the *Schizomycetaceæ* or unicellular fungi, or lower fungi, or bacteria *sensu lato* are without chlorophyl and generally without chromatophores, and it is therefore doubtful whether it is correct to classify them with the Algæ, as is usually done. They are believed, however, to be derived from the *Cyanophyceæ* or Blue-Green Algæ. They may be defined as thallophyta without chlorophyl starch or chromatophores, and with a vegetative body which is usually composed of a mass of filaments, or "mycelium." The mycelial filaments or threads are also known as *hyphæ*, and may be of very different shape, length and breadth; they may be straight, variously bent, septate, or non-septate. These organisms being unprovided with chlorophyl cannot make use for their *nutrition* of the carbon-dioxide of the air; they derive their carbonaceous food material from complex organic matter, often decaying matter. Fungi may be *saprophytic* or *parasitic;* the same fungus may at times be a saprophyte, at other times a true parasite.

Reproduction.—The seeds of the higher plants may be said to be represented in the fungi by the roundish or oval bodies known by the generic term spores, of which there are a number of types, some sexual, some asexual. The principal ones are the following:—

(1) *Gonidia* (endospores, spores *sensu stricto*).—These take origin inside a special receptacle called sporangium, which is frequently terminal and

Fig. 2.—Zygospore formation in *Rhizopus nigricans.*

aerial. When the spores are 2, 4, 8, or a multiple of 8, they are generally called ascospores, and the cell or spore-case structure containing them is known as an *ascus.*

(2) *Zygospores.*—These spores result from a conjugation or modified sexual act between two special club-shaped hyphal processes (gametes), which are similar in shape and do not show any apparent sexual differentiation; the gametes come into contact and unite forming a large cell with a very resistant double wall, called *Zygospore.*

(3) *Oöspores.*—These result from a complete sexual conjugation between sexually differentiated elements; a female element (oösporangium,

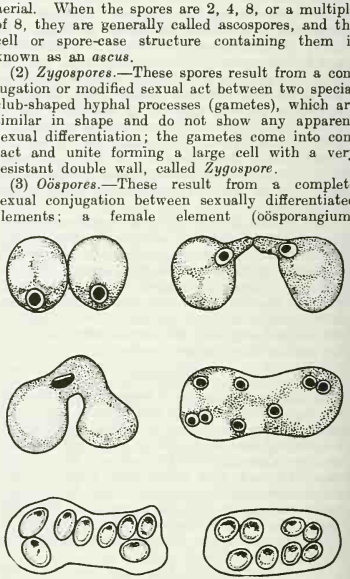


Fig. 3.—Zygosis and ascus formation in *Zygosaccharomyces octosporus* (after Guilliermond).

oögonium), and a male element. The female element *oösporangium* or *oögonium* has a thick capsule with several pores and containing some roundish protoplasmatic masses; female gametes, macrogametes or oöspheres. The *male element* (male gamete, antheridium), which originates on a special delicate hypha, comes into contact with the oösporangium, sending a protoplasmatic process through it. In some cases the antheritidium

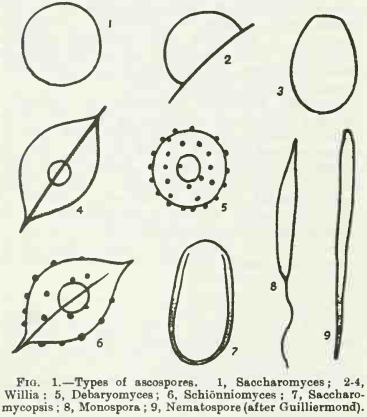


Fig. 1.—Types of ascospores. 1, Saccharomyces; 2-4, Willia; 5, Debaryomyces; 6, Schizoniomyces; 7, Saccharomycopsis; 8, Monospora; 9, Nematospore (after Guilliermond).

divides into several motile bodies, spermatozoids, antherozoids, which fertilize the female gametes.

(4) *Conidia* (Exospores).—These are asexual spores. They are roundish or oval, occasionally spirally-shaped bodies, which take origin from the mycelial threads by a process of budding or septation or abstriction, and may be simple or divided by septa. They are at first unicellular, but later

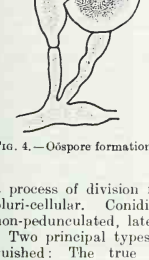


Fig. 4.—Oöspore formation.

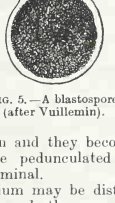


Fig. 5.—A blastospore (after Vuillemin).

a process of division may set in and they become pluri-cellular. Conidia may be pedunculated or non-pedunculated, lateral or terminal.

Two principal types of conidium may be distinguished: The true conidium and the *pseudo-conidium* or *aleuriospore*. True conidia are easily detached from the mycelial hyphæ bearing them, and when they have become free they originate new spores by a process of budding, or give rise to mycelial filaments by germination. True conidia are incapable of forming new spores or new mycelial threads while they remain attached to the parent mycelium. The mycelial hypha which carries the conidia is termed *conidiophore* or *sporophore*; a *phialide* is a flask-shaped segment interposed between the sporophore and the conidia; a *prophialide* is a special article on the sporophore supporting several phialides.

The false conidia or *pseudo-conidia* or *aleuriospores*, which may be lateral, terminal or intercalary, are not originally distinct from the thallus and are not easily detached; they are only set free by the death of the mycelial hypha to which they are attached.

(5) *Thallospores*.—A thallospore is merely a portion of the thallus, or vegetative body, which becomes secondarily adapted to the purposes of reproduction. There are several varieties of thallospores, the principal ones being:—

The *Blastospore*, oval or roundish, formed by a process of budding.

The *Arthrospore*, formed simply by the segmentation and disarticulation of a hyphal element or mycelial thread; it is at first square, and later becomes roundish or oval.

The *Chlamydospore*.—This is merely an arthrospore of large size undergoing encystement.

(6) *Hemispores*.—The mycelial hypha becomes differentiated, forming an ampulliform structure called "protoconidium," which later divides into several segments or "deuteroconidia," which are the true reproduction spores.

Classification.

Fungi may be separated into two large divisions: The *Myxomycetes*, characterized by the vegetative body being under the form of a multinucleate naked plasmodium, and the *Eumycetes*, characterized by the vegetative body being generally filamentous. Fungi parasitic of man are found only in the second division (Eumycetes), which may be subdivided as follows:—

Eumycetes.
- Class I.—*Fungi Imperfecti*. Mycelium septate. No ascospores.
- Class II.—*Ascomycetes*. Mycelium septate when present. Ascospores.
- Class III.—*Basidiomycetes*. Mycelium septate. Basidiospores.
- Class IV. — *Phycomycetes*. Mycelium non-septate in vegetative stage.

(*a*) *Fungi Imperfecti.*

The Class *Fungi Imperfecti* Fuckel 1869 is most important from a medical point of view; it may be subdivided into (*a*) *Deuteromycetes* Saccardo 1886 (accessory fructifications present) and (*b*) *Hyphales* Vuillemin 1910 (accessory fructifications absent). Only the latter group contains fungi parasitic of man. It may be classified as follows:—

Hyphales Vuillemin (= *Hyphomycetes* Fries).
- Order I. — *Microsiphonales* Vuillemin 1910. (hyphæ-bacilliform).
- Order II.—*Thallosporales* Vuillemin 1910. (Reproduction by thallospores).
- Order III.—*Hemisporales* Vuillemin 1910. (Reproduction by hemispores).
- Order IV.—*Conidiosporales* Vuillemin 1910. (Reproduction by conidia).

The Order *Microsiphonales* contains two families: The *Mycobacteriaceæ* Miche 1909, in which no definite mycelium is observed, and the *Nocardiaceæ* Castellani and Chalmers 1918, in which a definite mycelium is present.

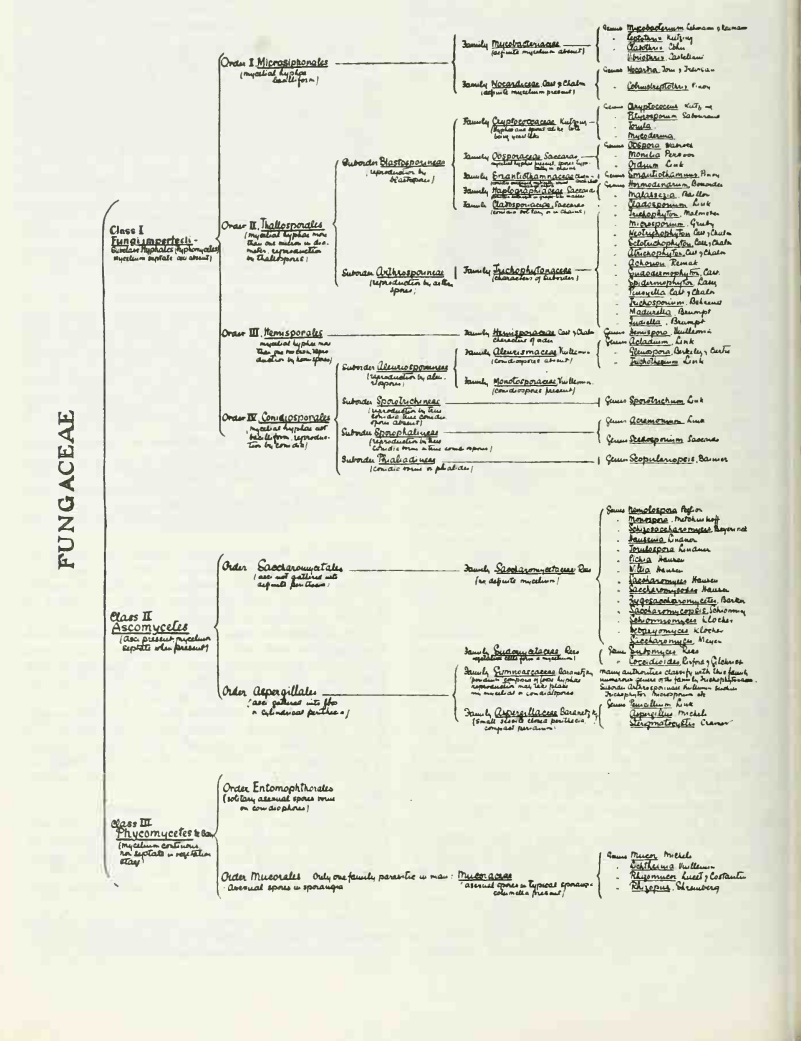
The *Mycobacteriaceæ* are generally classified with the bacteria and not with the higher fungi, and contain five principal genera: Genus *Mycobacterium* Lehmann and Neumann; *Leptothrix* Kutzing; *Cladothrix* Cohn; *Vibriothrix* Cast.

The *Nocardiaceæ* contain two genera: *Nocardia* Toni and Trevisan, which grows aerobically, is easily cultivated and produces athrospores. *Cohnistreptothrix* Pinoy, which is difficult of cultivation, mostly anaerobic, and does not produce arthrospores.

The Order *Thallosporales Vuillemin* 1910 is divided into two sub-orders: The *Blastosporineæ*, in which reproduction takes place by means of blastospores, and the *Arthrosporineæ*, in which reproduction takes place by arthrospores.

The sub-order *Blastosporineæ* contain five principal families:—

(1) The *Cryptococcaceæ* Kutzing.—The hyphæ are hardly different from the conidia, both being yeast-like; conidia not arranged in chains.


FUNGACEAE
Class I Fungi imperfecti – (Eumycetes Mycetales Hyphomycetes mycelium septate no sexual)
Order I. Microsiphonales (mycelial hyphae coenocytic)
Family Mycotaenaceae (septate mycelium absent)
Genus Mycotaenium Cohn & Lemm
Genus Mycotaenia Kütz.
Genus Mycotaenella Cohn
Genus Mycotaenula Zukal
Family Nocardiaceae Cohn & Zukal (septate mycelium present)
Genus Nocardia Trev. & Peirce
Genus Actinomyces Corda
Order II. Thallosporales (mycelial hyphae more than one nucleus in the mature reproduction by thallospores)
Suborder Blastosporineae (reproduction by blastospores)
Family Cryptosporaceae Kütz. (hyphae one spored at the base bearing spore like)
Genus Cryptococcus Kütz. em
Genus Pleurosporium Schroeter
Genus Zopfia Rabenh.
Genus Protomyces Unger
Family Oosporaceae Saccard. (hyphae septate branched spores single cells or chains)
Genus Oospora Wallroth
Genus Monilia Persoon
Genus Oidium Link
Family Endomycetaceae Engler & Prantl (hyphae septate branched spores single cells or chains)
Genus Endomyces Reess
Genus Saccharomyces Meyen
Family Mucoraceae Dietel & Neger (hyphae non septate spores in sporangia)
Genus Mucor Micheli
Genus Rhizopus Ehrenb.
Genus Thamnidium Link
Genus Phycomyces Kunze
Genus Absidia Van Tieghem
Genus Sporodinia Link
Genus Chaetocladium Fres.
Genus Piptocephalis De Bary
Genus Syncephalis Van Tieghem
Genus Helicostylum Corda
Genus Choanephora Currey
Genus Thamnocephalis Sommerf.
Genus Dicranophora Corda
Genus Mycotyphium Brefeld
Genus Haplosporangium Bref.
Genus Gilbertella Sacc. & Trott.
Genus Zygorhynchus Vuill.
Genus Rhizopodium Schroeter
Genus Mortierella Coem.
Genus Actinomucor Vuill.
Genus Backusella Lendner
Genus Syncephalastrum Schroeter
Genus Circinella Van Tiegh. & Le Mon.
Genus Cunninghamella Matr.
Genus Thamnostylum Lendner
Genus Phycomucor Van Tieghem
Genus Spinellus Van Tieghem
Genus Dissophora Schröter
Genus Rhizomucor Lucet & Costantin
Genus Rhizopus Ehrenberg
Family Thallophthoraceae (characters of suborder)
Genus Thallophthora Cke. & Ell.
Genus Sclerotiophthora Cke. & Mass.
Genus Sclerotiophthoropsis Cke. & Mass

(2) The *Oösporaceæ* Saccardo. Some long hyphæ present, spores typically in chains.

(3) The *Enantiothamnaceæ* Chalmers and Archibald.—Conidia arranged verticillately around the septa of the mycelial hyphæ.

(4) The *Haplographiaceæ*.—When living parasitic conidia are collected in grape-like masses.

(5) The *Cladosporiaceæ* Saccardo.—Conidia solitary or in chains.

The sub-order *Arthrosporineæ* contains a very important family, the *Trichophytonaceæ*, reproduction by Arthrospores, long hyphæ present in cultures, often parasitic of hair. This family includes a large number of genera, including Trichophyton, Microsporon and Achorion. It is to be noted, however, that many authorities consider these fungi to belong to the Ascomycetes (family Gymnoascaceæ) and not to the fungi Imperfecti.

The third Order of the Hyphales, the Hemisporales, reproduction by hemispores, have a mycelium composed of abundant hyphæ, which are thin, but always more than 1 micron in diameter. The conidiophores are branched, each branch terminating in ampulliform structure, preceded by an annular constriction produced by a rigid thickening of the wall.

The protoconidium after a time divides into a number of sporiform segments (deuteroconidia).

The fourth Order *Conidiosporales*, which, as already stated reproduce by means of conidia, contains four principal sub-orders:—

(1) The Aleurosporineæ Vuillemin 1914. Reproduction takes place by aleurospores.

(2) The Sporotrichineæ Vuillemin 1910.—Reproduction by true conidia, but true conidiophores are absent.

(3) The Sporophoralineæ Vuillemin 1910.—Reproduction takes place by true conidia carried by true conidiophores.

(4) The Phialidineæ Vuillemin 1910.—Reproduction by true conidia borne on phialides.

(*b*) *Class II. Ascomycetes.*

The fungi belonging to this class, as already mentioned, are characterized by reproduction taking place by means of ascospores (gonidia endospores), which originate inside special cells called asci. The Ascomycetes contain three very important families:—

(*a*) The *Saccharomycetaceæ* Rees 1870.—Mycelium only slightly developed or absent. Asci isolated not differentiated from vegetative cells.

(*b*) The *Endomycetaceæ*.—Mycelium well developed.

(*c*) The *Aspergillaceæ*.—Asci generally contained in a globose hollow structure (perithecium) with a terminal opening or pore. Compact peridium.

All these families contain important fungi parasitic of man as shown in the diagrams.

(*c*) *Class III. Phycomycetes.*

The Phycomycetes which are characterized by the mycelium being continuous, non-septate, in the vegetative stage, contain several families, one of which, the *Mucoraceæ*, has organisms parasitic of man. The fungi belonging to this family have a branching mycelium with *aerial* branches (gonidiophores), each of which supports on its distal extremity a globular, pear-shaped or claviform sporangium, called *gonidangium*, which is at first separated from the gonidophore by a septum. This septum later protrudes into the lower portion of the sporangium and forms a variously shaped structure known as Columella. By free cell-formation, gonidia develops inside the sporangium. The sporangial protoplasm not used in the formation of the gonidia is transformed into a peculiar mucillaginous substance, which later dries up and is the cause of the sporangium bursting. Each gonidium which has become free gives rise by germination to a mycelial filament. There is also at times a sexual mode of reproduction consisting in the conjugation of undifferentiated non-motile gametes, with formation of Zygospores. When growing in unfavourable media numerous species reproduce only by conidia and chlamydospores.

The family Mucoraceæ contains a number of genera, among which the following have species parasitic of man:—

(1) *Mucor* Micheli.—Mycelium ramified, rhizoids absent.

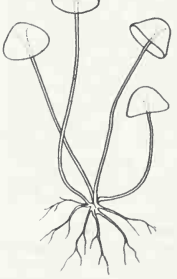


Fig. 6.—*Rhizopus niger*, Ciaglinski and Hewelke.

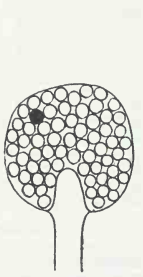


Fig. 7.—Type of sporangium found in Genus *Rhizopus*.

(2) *Rhizomucor* Lucet and Costantin.—Rhizoids (slender root-like filaments) present, columella ovoid.

(3) *Rhizopus* Ehrenberg.—Rhizoids present, columella mushroom-like.

(4) *Lichtheimia* Vuillemin.—Peduncle supporting sporangium ends in a special formation encircling the base of the columella.

Diseases due to the fungi of the family Mucoraceæ are often called "mucormycoses."

Certain Biological and Biochemical Characters of Fungi.

The *biological* and *biochemical characters* of fungi are very interesting, and of great practical importance.

Recent investigations have shown numerous analogies with the lower fungi (bacteria), as regards production of toxins, and especially as regards serological reactions developing in inoculated animals.

About twenty years ago the late Dr. Macfadyen, Director of the Lister Institute, inoculated rabbits with cultures of a saccharomyces, and observed a production of specific agglutinins in the blood for the particular species he had inoculated. These results were confirmed and enlarged, using other fungi, by G. H. Rogers, Concetti, Quarelli, &c., and Widal and Abrami have described a general diagnostic method, "Sporo-agglutination Method," based on the observation that patients suffering from mycological diseases contain specific agglutinins for the spores of the causative fungi. In my experience, however, in many cases, in addition to specific agglutinins, there is present also a large amount of non-specific ones, and this generally detracts from the usefulness of the method.

As regards *toxins*, Auchair and Verliac have obtained a toxic product soluble in ether from *Nocardia bovis*, which they called "Actinimycetine." Ceni, Besta, and other observers have extracted various toxins from fungi of the genus Aspergillus, and believe them to be the cause of pellagra. Charrier, Roger and others have extracted toxins from fungi of the genus Monilia.

Vaccines have been prepared, using cultures of Monilias killed by heat or by carbolic acid. Plato has prepared a trichophyton vaccine by killing cultures of various trichophytons by heat and triturating them. When injecting this vaccine in patients affected with ringworm, he has observed a general reaction similar to that induced by tuberculin in tubercular patients. A cuti-reaction in patients suffering from sporotrichosis has been described by De Beurmann.

Biochemical Changes induced by Fungi.

Certain fungi may induce profound chemical changes, and are of great importance in agriculture and industry. Everyone knows the rôle played by organisms of the family Saccharomycetaceæ in alcoholic fermentation and in the production of wine and beer. Certain fungi ferment a large number of sugars and other carbohydrates, others a few or none. I have happened to find a monilia, which very rapidly splits a substance generally considered to be non-fermentable, viz., *inulin*.

Mycological Method to detect various Carbohydrates.

As is well known, the property certain fungi have of fermenting glucose has been used for many years as a method of routine to detect this sugar in the urine. In this connection I may perhaps be allowed to describe briefly a mycological method for the detection of other sugars and carbohydrates which I theoretically devised some years ago, but only recently worked out experimentally, jointly with Dr. F. E. Taylor in Professor Hewlett's institute. It may perhaps be of some slight interest to give here some details of this method and make it better known.

As already stated, since many years so-called German yeast (baker's yeast, brewer's yeast) has been used for the detection of glucose, but this is the only substance for which so far such method of detection has been employed in pathological investigations, and, as a matter of fact, this method of finding glucose (although considered specific in so many text-books on Pathology) is inexact, because in our experience German yeast ferments as a rule, not only glucose, but also levulose, galactose, maltose, saccharose, and sometimes even lactose. If a specimen of urine undergoes fermentation after the addition of German yeast, it does not mean, therefore, that this urine contains glucose; it might contain levulose or galactose or maltose, or even lactose, &c. To detect and determine with certainty glucose, it is necessary to use an organism which will split only this sugar, and no other. We have such an organism in *M. balcanica* Cast., which does not ferment any substance apart from glucose. As regards detection and identification of other sugars, such as maltose, galactose, &c., we have no fungi, unfortunately, and apparently they do not exist in Nature, which will select only one of the carbon compounds to the exclusion of all others, fungi which will ferment, for example, only maltose, or only galactose, or only inulin, or only lactose, &c. These various substances, however, may be identified by using our mycological method, which might be called "Conjugated or parallel mycological method," because we do not use one species only of fungi, but two or more, comparing their action on the substance to be determined. The simplest way of carrying out our method to determine whether a substance is or is not a certain carbohydrate, is to test on the substance whenever possible the action of two germs known to be identical in all their fermentative reactions except on that particular carbohydrate. For instance, in order to see whether a given chemical substance is maltose, the substance may be tested with two organisms identical in all their biochemical reactions, except their action on maltose, one fermenting it, the other not. I shall make a few examples, viz.: The determination of levulose, maltose, galactose, lactose, saccharose, inulin.

Determination of Levulose.—Let us assume we want to determine whether a certain substance is *levulose*. A sterile 1 per cent. solution of the substance is made in sugar-free peptone water and distributed into two tubes (1 and 2), each containing a fermentation tube. No. 1 is inoculated with *M. krusei* Cast., and No. 2 with *M. balcanica* Cast. The tubes are incubated at 35° C. for forty-eight hours, and the results are then read. If No. 1 tube (*M. krusei* Cast.) contains gas, and No. 2 tube

(*M. balcanica* Cast.) contains no gas, the substance is *levulose*. This is easily understood by keeping in mind the following facts: *M. krusei* ferments

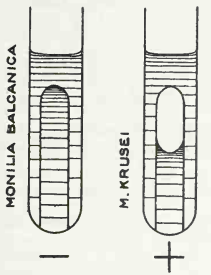


FIG. 8.—Identification of lævulose.

only glucose and levulose; *M. balcanica* ferments only glucose. The substance we are testing having been fermented by *M. krusei* must therefore be either glucose or levulose, but as it is not fermented by *M. balcanica* it cannot be glucose, which is always attacked by that fungus; it can, therefore, only be levulose.

Determination of Maltose.—A 1 per cent sterile solution is made in sugar-free peptone water of the substance which we wish to ascertain whether it is maltose. The solution is distributed into two sterile tubes, which are labelled 1 and 2. No. 1 tube is inoculated with *M. pinoyi* Cast., and No. 2 with *M. krusei* Cast. If after forty-eight hours incubation at 35° No. 1 (*M. pinoyi*) contains gas, and No. 2 (*M. krusei*) does not, the substance is maltose. This is explained by the fact that *M. pinoyi* Cast. ferments only three carbon compounds I know of: Glucose, levulose, maltose; *M. krusei* ferments only two, glucose and levulose. The substance being fermented by *M. pinoyi* might be either glucose or levulose or maltose; but it is not fermented by *M. krusei*; it cannot therefore be glucose or levulose, and there remains only one possibility: It must be maltose.

Identification of Galactose.—Same technique, but No. 1 tube is inoculated with *M. metalondinensis* Cast., and No. 2 tube with *M. pinoyi* Cast. If after forty-eight hours incubation at 35° C. No. 1 tube (*M. metalondinensis*) contains gas and No. 2 tube (*M. pinoyi*) does not, the substance must be galactose. The explanation lies in the fact that *M. metalondinensis* ferments the following four carbon compounds only: Glucose, levulose, maltose, galactose; while *M. pinoyi* ferments only glucose, levulose and maltose. The substance being fermented by *M. metalondinensis*, there are four possibilities: It may be glucose or levulose, or maltose, or galactose, but is not fermented by *M. pinoyi* (which attacks glucose, levulose and maltose); it cannot therefore be glucose, nor levulose, nor maltose; it can only be galactose.

Determination of Lactose.—Same technique as

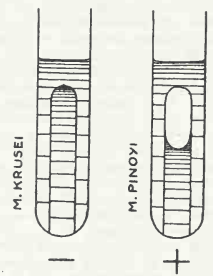


FIG. 9.—Identification of maltose.

for the determination of the carbohydrates already mentioned, but instead of using micro-organisms belonging to the higher fungi, we can use bacteria. The substance to be identified is made into a 1 per cent. sterile solution of peptone water, and distributed into two tubes, No. 1 and No. 2. Tube No. 1 is inoculated with *B. pseudoasiaticus* Cast., and tube No. 2 with *B. pseudocoli*. If after forty-eight hours incubation at 37° C. tube No. 1 (*B. pseudoasiaticus*) does not contain gas, while tube No. 2 (*B. pseudocoli*) contains gas, the substance must be lactose, because *B. pseudoasiaticus* and *B. pseudocoli* are absolutely identical in all their fermentative characters except as regards lactose, which is not attacked by *B. pseudoasiaticus*, and is, on the other hand, fermented with production of gas by *B. pseudocoli*.

In practice, if it is known beforehand that the substance to be determined is Fehling-reducing, two bacilli found in every laboratory may be used, viz.: *B. paratyphosus* B and *B. coli*. If a Fehling-reducing substance is not fermented by *B. paratyphosus* B and is fermented by *B. coli*, it is *lactose*. Why? Because the two germs as regards fermentation of Fehling-reducing substances differ only in their action on lactose; *B. paratyphosus*, as well known, does not ferment it, while *B. coli* ferments it. *B. paratyphosus* B and *B. coli* differ in their fermentative action, and the various sugars and carbohydrates only as regards raffinose and salicin, inosite and glycerin. A substance which is not fermented by *B. paratyphosus* B, and is fermented by *B. coli*, may therefore be lactose, raffinose, salicin or glycerin, but if the substance is Fehling-reducing it must be lactose.

It is often stated in text-books that if a urine reduces Fehling and is not fermented by ordinary baker's yeast (German yeast), the reducing substance is lactose. There are, however, two important sources of error: first, quite a number of

specimens of German yeast ferment lactose; second, even if the German yeast should not ferment lactose, this is not the only Fehling-reducing substance which may not be fermented by baker's yeast—the Pentoses, for instance.

Determination of Saccharose.—A 1 per cent. solution of the substance suspected to be saccharose is made in sugar-free peptone water, and some of the solution is placed into tubes 1 and 2. Tube No. 1 is inoculated with *M. tropicalis* Cast., and tube No. 2 with *M. metalondinensis* Cast. If gas develops in tube 1 (*M. tropicalis*) and not in tube 2 (*M. metalondensis*) the substance is saccharose. This is easily understood if the following facts are kept in mind: *M. tropicalis* ferments only the following carbon compounds: Glucose, levulose, maltose, galactose, saccharose; *M. metalondinensis* only the following four carbon compounds: Glucose, levulose, maltose, galactose. If a substance is fermented by *M. tropicalis*, there are therefore five possibilities; it may be glucose or levulose, or maltose, or galactose, or saccharose; but if the same substance is not fermented by *M. metalondinensis*, it cannot be either glucose or levulose or maltose or galactose, and must therefore be saccharose.

To the above purely mycological method a chemico-mycological formula, useful in practice, may be added:—

Fehling ... ... − / *M. tropicalis* Cast. + } = Saccharose.

This is explained by the fact that *M. tropicalis* Cast. ferments with production of gas, glucose, levulose, maltose, saccharose, and no other substance. If Fehling is negative it cannot be any of the first three substances, as they are all Fehling-reducing, and it must therefore be saccharose.

Determination of Inulin.—Same technique as for saccharose, but tube No. 1 is inoculated with *M. macedoniensis*, and tube 2 with *M. rhoi*. If gas appears in tube 2 (*M. rhoi*) the substance is *inulin*. This is easily understood if one bears in mind the fact that *M. macedoniensis* and *M. rhoi* are identical in all their fermentative reactions except in inulin, which is fermented by *M. macedoniensis*, but not by *M. tropicalis*. If a substance, therefore, is fermented with production of gas by *M. macedoniensis* and not by *M. rhoi*, it must be inulin.

The working of the method can be seen at a glance in the accompanying table and key.

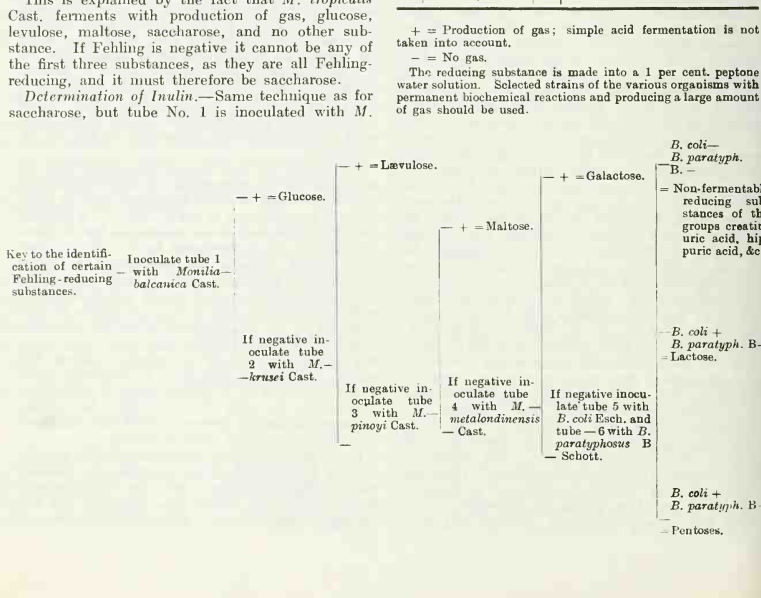
IDENTIFICATION OF FEHLING-REDUCING SUBSTANCES.

M. balcanica Cast.	*M. krusei* Cast.	*M. pinoyi* Cast.	*M. metalondinensis* Cast.	*B. paratyphosus* B Schott.	*B. coli* Esch.	Reducing Substance
+	+	+	+	+	+	Glucose.
−	+	+	+	+	+	Lævulose.
−	−	+	+	+	+	Maltose.
−	−	−	+	+	+	Galactose.
−	−	−	−	+	+	Pentoses.
−	−	−	−	−	+	Lactose.
−	−	−	−	−	−	Non-fermentable reducing substances of the groups creatinin, hippuric acid, uric acid, &c.

\+ = Production of gas; simple acid fermentation is not taken into account.

− = No gas.

The reducing substance is made into a 1 per cent. peptone water solution. Selected strains of the various organisms with permanent biochemical reactions and producing a large amount of gas should be used.


Key to the identification of certain Fehling-reducing substances.
Inoculate tube 1 with *Monilia balcanica* Cast.
− + = Glucose.
If negative inoculate tube 2 with *M. krusei* Cast.
− + = Lævulose.
If negative inoculate tube 3 with *M. pinoyi* Cast.
− + = Maltose.
If negative inoculate tube 4 with *M. metalondinensis* Cast.
− + = Galactose.
If negative inoculate tube 5 with *B. coli* Esch. and tube 6 with *B. paratyphosus* B Schott.
B. coli—*B. paratyph.* B. − = Non-fermentable reducing substances of the groups creatin, uric acid, hippuric acid, &c.
B. coli + *B. paratyph.* B— = Lactose.
B. coli + *B. paratyph.* B + = Pentoses.

Presence of more than one Fermentable Substance.

If more than one sugar or other fermentable carbon compound is suspected to be present, this may to a certain extent be ascertained, and the various fermentable substances determined by our method. Let us assume that a liquid after gas-fermentation with *M. balcanica* Cast. is still fermentable with production of gas by *M. krusei* Cast., the conclusion is that in addition to glucose the liquid contained levulose; of course, care should be taken to use strains of *M. balcanica* and *M. krusei* having approximately the same fermentation power on glucose. If now the liquid after exhaustion first with *M. balcanica* Cast. and then with *M. krusei* Cast. is fermentable with production of gas by *M. pinoyi* Cast., the presumption is that, in addition to glucose and levulose, maltose was present, and this is easily understood if we remember that *M. balcanica* produces gas in glucose only, *M. krusei* Cast. in glucose and levulose; and *M. pinoyi* Cast. in glucose, levulose and maltose.

Use of Mycological Method in Urine Analysis.

Dr. F. E. Taylor and myself have carried out a number of experiments, adding to samples of urine containing a Durham's fermentation tube. A third or equal amount of sugar-free peptone water should be added to the urine, otherwise the fungi may grow very scantily, and there may be no production of gas. The five tubes are inoculated: one with *M. balcanica*, one with *M. krusei*, one with *M. pinoyi*, one with *M. metalondinensis*, one with *B. paratyphosus*, and one with *B. coli*. The working of the method can be seen at a glance from the accompanying table and key, taken from a joint publication by myself and Taylor.

Addendum.

Unfortunately some months ago an accident, the catching fire of the 20° C. incubator in which the collection of monilias was kept, destroyed a number of important strains, including *M. balcanica* Cast., which is specific for glucose. At the present time only the following monilias with permanent fermentative reactions for use in urine analysis, *M. krusei* Cast. (ferments, glucose and levulose), *M. tropicalis* Cast. (ferments, glucose, levulose, maltose, galactose and saccharose), *M. macedoniensis* Cast. (ferments with production of gas, glucose, levulose, galactose, saccharose and inulin).

	Glucose	Levulose	Maltose	Galactose	Saccharose	Lactose	Mannite	Dulcite	Dextrin	Raffinose	Arabinose	Adonite	Inulin	Sorbite
Monilia balcanica Cast.	AG	As	O	O	O	O	O	O	O	O	As	O	O	O
M. krusei Cast.	AG	AG	O	O	O	O	O	O	O	O	O	O	O	O
M. macedoniensis Cast.	AG	AG	A or O	AG	AG	O	O	O	O	O	O	O	AG	O
M. metalondinesis Cast.	AG	AG	AG	AG	O	O	O	O	O	O	O	O	O	O
M. pinoyi Cast.	AG	AG	AG	O	O	O	O	O	O	O	O	O	O	O
M. rhoi Cast....	AG	AG	Avs	AG	AG	O	O	O	O	O	O	O	O	O
Bacillus coli Escherich	AG	AG	AG	AG	O	AG	AG	AG	AG	AG	AG	O	O	AG
B. paratyphosus B Schottmüller ...	AG	AG	AG	AG	O	O	AG	AG	AG	O	AG	O	O	AG
B. pseudoasiaticus Cast.	AG	AG	AG	AG	AG	O	AG	AG	AG	AG	AG	O	O	AG
B. pseudocoli Cast.	AG	AG	AG	AG	AG	AG	AG	AG	AG	AG	AG	O	O	AG
B. typhosus Eberth	A	A	A	A	O	O	A	O	A	As	O	O	O	A

Abbreviations used in the above Table:

A = acid; G = gas; S = slight; vs = very slight; O = negative result—viz., neither acid nor clot in milk, neither acid nor gas in sugar media, non-production of indol, non-liquefaction of gelatin or serum as the case may be.

various sugars and other carbohydrates, and also examining a certain number of pathological urines. The conclusion we have come to is that the method can be used in urine analysis with advantage, especially in the detection of glucose, levulose, maltose, galactose, lactose and pentoses. A point of great importance is that the urine should be aseptic; if it cannot be collected aseptically it should be sterilized as soon as possible, after distribution in the tubes, in Koch's steamer for thirty minutes on two consecutive days. It should never be autoclaved, as this procedure may alter the characters of the sugars present. A portion of the urine is distributed in five sterile tubes each containing a Durham's fermentation tube. A third or equal amount of sugar-free peptone water should be added to the urine, otherwise the fungi may grow very scantily, and there may be no production of gas. The five tubes are inoculated: one with *M. balcanica*, one with *M. krusei*, one with *M. pinoyi*, one with *M. metalondinensis*, one with *B. paratyphosus*, and one with *B. coli*. The working of the method can be seen at a glance from the accompanying table and key, taken from a joint publication by myself and Taylor.

However, even with these five species, in conjunction with *B. paratyphosus* B and *B. coli*, several carbohydrates can be detected and identfied as shown by the following formulæ:—

Monilia krusei Cast. ... + = Glucose or levulose.

M. macedoniensis Cast. ... 0 } = Maltose.
M. tropicalis Cast. ... + }

M. macedoniensis Cast. ... + } = Inulin.
M. tropicalis Cast. ... 0 }

M. krusei Cast. ... ... 0 }
M. macedoniensis Cast. ... + } = Galactose.
M. tropicalis Cast. ... + }
B. paratyphosus B Schott. + }

M. macedoniensis Cast. ...	+	= Saccharose.
M. tropicalis Cast. ...	+	
B. paratyphosus B Schott.	0	
M. tropicalis Cast. ...	0	= Lactose (most probably, but it might be raffinose or glycerine; test with Fehling; if positive, Lactose).
B. paratyphosus B Schott.	0	
B. pseudocoli Cast. ...	+	
M. tropicalis Cast. ...	0	= Pentose (if Fehling positive).
B. paratyphosus B Schott.	+	
B. coli	+	

For urine analysis it is advisable to use as a matter of routine a set of five tubes, one inoculated with *M. krusei*, one with *M. macedoniensis*, one with *M. tropicalis*, one with *B. paratyphosus* B, and one with *B. pseudocoli*. The results may be arranged as follows:—

Monilia krusei Cast. ...	+	= Glucose (or lævulose).
M. macedoniensis Cast. ...	+	
M. tropicalis Cast.	+	
B. paratyphosus B Schott.	+	
B. pseudocoli Cast. ...	+	
M. krusei Cast.	0	= Maltose.
M. macedoniensis Cast. ...	0	
M. tropicalis Cast.... ...	+	
B. paratyphosus B Schott.	+	
B. pseudocoli Cast. ...	+	
M. krusei Cast.	0	= Galactose.
M. macedoniensis Cast. ...	+	
M. tropicalis Cast. ...	+	
B. paratyphosus B Schott.	+	
B. pseudocoli Cast. ...	+	
M. krusei Cast.	0	= Lactose (most probably, but it might be raffinose or glycerine. Test with Fehling; if positive, Lactose).
M. macedoniensis Cast. ...	0	
M. tropicalis Cast. ...	0	
B. paratyphosus B Schott.	0	
B. pseudocoli Cast. ...	+	
M. krusei Cast.	0	= Pentose (provided Fehling be positive).
M. macedoniensis Cast. ...	0	
M. tropicalis Cast. ...	0	
B. paratyphosus B Schott.	+	
B. pseudocoli Cast. ...	+	
M. krusei Cast.	0	= Saccharose.
M. macedoniensis Cast. ...	+	
M. tropicalis Cast. ...	+	
B. paratyphosus B Schott.	0	
B. pseudocoli Cast. ...	+	
M. krusei Cast.	0	= Inulin.
M. macedoniensis Cast. ...	+	
M. tropicalis Cast. ...	0	
B. paratyphosus B Schott.	0	
B. pseudocoli Cast. ...	0	

I venture to think that this method, when more generally known, will perhaps be found useful in the detection of those sugars and carbohydrates the identification of which is long and laborious when made by purely chemical methods.

Having to-day referred to the morphological characters of fungi and their classification, as well as, though very incompletely, to their biological and biochemical properties, I propose, with your permission, to deal in the next lecture with fungi as specific causes of disease.

A NEW VEHICLE FOR EMETINE BISMUTHOUS IODIDE.

By T. J. G. Mayer, M.R.C.S., Gambia.

The problem of finding locally a vehicle for E.B.I., which would pass through the stomach unchanged and be digested by the intestinal juices, was solved by rubbing up the drug with sixteen parts of mutton fat, moulding the mass into rounded pills of about 7 gr. in weight, and covering each with a layer of melted mutton fat applied with a paint brush.

These pills pass through the stomach unchanged. The fat is solid at body temperature, is not digested until it is too far from the pyloric orifice to be regurgitated and cause vomiting or even nausea.

That the E.B.I. was altered by the intestinal juices was shown by the discoloration of the fæces and the cure of the dysentery.

Pills containing 1½ gr. of the drug and about 7½ gr. of mutton fat are about as large as may be conveniently swallowed. Two were given each night for twelve consecutive nights.

We kept the pills so made in the ice chest, but possibly the addition of thymol to them might serve as a preservative.

Treatment of Malaria Report of the Sub-committee of Medical Research of the National Malaria Committee (Public Health Reports, United States Public Health Service, December, 1919).—The Subcommittee on Medical Research of the National Malaria Committee composed of C. C. Bass, W. Krauss, W. H. Deaderick, G. Dock and C. F. Craig, present the following as a standard method of treatment of malaria for the purpose of curing the patient of his infection and recommends its general use by the medical profession. They believe that this treatment will, in the great majority of cases, prevent relapses in the patients and also prevent transmission of infection to others. Their opinion is based largely upon the results of the treatment by this method, under average conditions, in their homes, of a large number of persons infected with malaria.

"For the acute attack 10 gr. of quinine sulphate by mouth three times a day for a period of at least three or four days, to be followed by 10 gr. every night before retiring for a period of eight weeks. For infected persons not having acute symptoms at the time only the eight weeks' treatment is required.

"The proportionate doses for children are: Under 1 year, ½ gr.; 1 year, 1 gr.; 2 years, 2 gr.; 3 and 4 years, 3 gr.; 5, 6 and 7 years, 4 gr.; 8, 9 and 10 years, 6 gr.; 11, 12, 13 and 14 years, 8 gr.; 15 years or older, 10 gr.

"It is not claimed that this is a perfect or even the best treatment in all cases, but it is the belief of the Committee that it is a good and satisfactory method for practical use to prevent relapse and transmission to other people."

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THE JOURNAL OF

Tropical Medicine and Hygiene

MAY 1, 1920.

THE EXPENSE OF OVERSEAS TRAVELLING WITHIN THE EMPIRE AND SOME OF ITS CONSEQUENCES.

LAST week the writer became acquainted with the case of two travellers from the Straits Settlements to Marseilles, who each paid £140 for a passage in a French steamer. Neither of them had been home for over seven years, and it was their first voyage home since going abroad to take up their duties. From Marseilles they had to pay their fares, with extra for luggage and certain other extras which the French Government find it necessary to impose. The figures ran into well-nigh £200 for each man. The accommodation afforded was meagre to a degree; although first-class cabin charges were imposed, the quarters assigned them were "cattle truck" in their lack of convenience. They could, it may be said, have waited for a British steamer, but no such vessel could take them for another month. As they had been granted leave, however, it meant that they would be spending one month of the leave of six months granted them in the place where they were located before starting for home, and as it takes a month to make the voyage home and another month to return again, it meant that three months only of their six months furlough would be at home.

The business firms they belonged to allowed officially £90 each for the complete journey home, so that at least the journey referred to exceeded the allowed amount by £100. Instead of £180 for the two, the lads had to pay well-nigh £400 and for a "cattle truck" accommodation. The lads had not, when the writer saw them, informed the head offices at home of this expenditure, and they were not a little concerned as to how the news would be received by them. Banks and business firms with branches abroad are known to be liberal to their employees abroad, but to spend double the allowance provided for travelling was a serious item to incur, and they had no authority to do so. They made themselves responsible for a debt of £100, a sum which would cut deeply into the necessary small amount they could save in their first years of service abroad.

Shortly before the war there appeared in these columns an article on the excessive charges imposed by British shipping authorities on travellers within the Empire, men connected with overseas business firms, and it was pointed out that such firms thwarted instead of helped overseas development by these charges. Several lines of shipping are subsidized by the British Government for the carrying of mails, &c., within the Empire, but they charge the employees sums for passages which are calculated to prevent their taking the amount of leave necessary to the European living in a tropical or sub-tropical climate, and the health of these men suffers in consequence in several ways, as the charges are prohibitive.

These charges where a wife and children have to be reckoned with will become still more serious, for no amelioration of fares takes place in their behalf. A species of exile in fact obtains which proves detrimental to mind and body to the husband, wife and children. The men sent for service abroad in banks, mercantile firms, &c., are advancing the cause of Empire as surely as if they served in any of the great public services. They

are chosen after careful medical selection to go abroad; so that we are sending the cream of our young men to the tropics which is not and never can be a white man's country—where he cannot rear healthy children to full manhood or womanhood, where educational facilities are meagre to a degree, and mental and physical deterioration must result as time goes on. Intercommunication with home is thwarted by the price of travel, and the Empire is the loser in consequence. Nor does the loss to Empire end here. The man himself by the nature of his life, often more or less isolated, at an early period of his life is hampered in his development. Home is far off, touch with the vivifying influence of life in Britain is cut off. His friendships are new friendships, the acquaintances of his youth, which naturally become the real friends of middle age, are lost to him, and he tends to live his life unto himself. He becomes introspective and what is now called "homo-sexual," a term of wide application, and used to fit psychologically almost every phase of mental phenomenon of modern man. To it is ascribed the cause of much insanity, crime, alcoholism, sexual immorality and bachelorhood, and even of intemperance in the *way of abstinence in alcohol*, &c. The subject is too long to deal with here, but there is no doubt that it is prevalent amongst those who go abroad for a considerable number of years to the detriment of those men, often of good mental calibre to begin with, who go abroad for fairly long spells of residence, especially in a tropical country.

Marriage corrects many of the evils attributed to homo-sexuality, but marriage is hindered in many ways until too late in life to thwart the evils of introspection, as we prefer to call it, rather than by the new name attached to the condition. By whatever name it is known, it frequently takes the form of living to one's self, and regarding one's neighbours as apart; his failings he attributes to others, and is imbued with supposed grievances. He avoids society, and at times seeks relief in drugs or alcohol, &c., and in time becomes an oddity. In ordinary parlance he is said to be "hipped." Unless the man obtains change of scene and surroundings he will likely lose his employment through drink or by becoming insane or so cantankerous that he cannot be put up with; he becomes a bad master and a worse servant.

The psychology of to-day is all in this direction, viz., that there is no such thing as abnormal mental phenomenon without a cause; hence the Bolshevist, the anarchist, the rabid prohibitionist, and much of the crime so prevalent amongst us.

The cure for this, as far as the class of men we are dealing with—namely, the British employee abroad in our Empire—is change; that is the prevention of sameness—the chief cause of introspection or psycho-analysis as it is technically called, due to a long spell in one place without a real holiday. But change is difficult to get; the price of travel is well-nigh prohibitive, and until this is met in some way the outlook is bad. The authorities of the firm are naturally not inclined to spend money unless it is compulsory; were it a physical ailment, such as fever, dysentery, &c., all would be well; but with mental depression, &c., the date is put off until it may be too late and the man has contracted vicious habits. The mental danger is greater than the physical, but it is less perceptible, and therefore more serious. The doctor untrained in mental diseases and phenomena—and few of us are so trained—does his best with tonics, diet, short changes of climate, &c., but these are insufficient.

The new psychology will in time come to our aid, but it is a long way off the practical stage of treatment at present.

The only practical outcome of this discussion is how is the question to be dealt with? From the health point of view it is one which concerns the medical men who have charge of the health of British folk overseas. The possibility of cheaper passages by sea becomes a health and hygienic necessity, and belongs to the sphere of medical treatment. The shipping companies will say: "We are not philanthropic bodies; we have to pay our way and see to the interests of our shareholders." What about the French? They see to it that their overseas countrymen are favoured; that the fares are at a price which are fair and calculated to facilitate more frequent visits to the homeland, and thereby contribute towards the maintenance of their overseas brethren. If France can do it, Great Britain can do it if the matter is taken in hand. For one Frenchman travelling there are twenty British, and in such proportion is the health of our people affected. The French will not help folk of other countries, as see the high price they charge the two British lads mentioned at the commencement of this article. Why should they? The policy of Britain seems to be to help foreigners and exploit their own folk. At times this comes hard upon us, and especially when it is a question not of commercial benefits only, but one in which life and death are involved, in which also the Imperial welfare is concerned. Who is to tackle it?

University News.

THE UNIVERSITY OF LIVERPOOL.

LIVERPOOL SCHOOL OF TROPICAL MEDICINE.

The Senate has awarded the Diploma in Tropical Medicine of the University of Liverpool to the following: W. J. W. Anderson, M.D. (Leeds); C. E. Cobb, L.R.C.P. (Lond.), M.R.C.S. (Eng.); Enid M. H. Cobb, L.R.C.P. (Lond.), M.R.C.S. (Eng.); D. D. Fernandes, L.R.C.P. and S. Edin.), L.R.F.P. and S. (Glasg.); P. T. J. O'Farrell, L.R.C.P. and S. (Irel.); E. A. Rennor, M.D., Ch.B. (Edin.); J. C. Vaughan, M.D., Ch.B. (Glasg.).

Annotations.

Antihelminthic Treatment of Intestinal Strongylosis of the Horse (M. C. Hall, R. H. Wilson, M. Wigdor, *Journal of the American Veterinary Medical Association*, vol. liv, N.S., vol. vii, No. 1, pp. 47-55).—Experiments carried out in the biological research laboratories of Messrs. Parke, Davis and Co., at Detroit, Michigan, showed that, contrary to the accepted theory, it is not very difficult to eliminate strongylus from the large intestine of the horse. The most suitable remedy is chenopodium oil, which ejects 95 to 100 per cent. of the strongylus if administered to horses which have fasted for thirty-six hours. The dose should be 16 to 18 c.c. given in one or more times, and accompanied or followed one to two hours later by 900 to 1,000 c.c. of linseed oil.

Rats as Agents in transmitting Ringworm to the Horse (D. J. Kok, *Tydschrift voor Diergeneeskunde*, vol. 46, No. 2, pp. 37-39, 2 figs, The Hague, January, 1919).—The author saw two horses affected with ringworm (*Trichophyton tonsurans*) in a riding school; the ringworm was localized to the carpal region, the head and the inner side of the thigh. The school had recently been invaded by rats, some of which the author examined in order to see whether they were the source of the infection. A rat was found with whitish scaly patches on the back and the microscopical examination of the skin and hair showed that trichophyton was present. The writer believes that the trichophyton observed in the rats was the same species as that found in the horses, but no cultures were carried out.

Spider Venom (*Journ. American Med. Assoc.*, February 14, 1920).—Little is positively known about the specific nature of the venom of spiders, although there has been much speculation. The venom is an oily, translucent, lemon-yellow liquid having an acid reaction and a hot, bitter taste. It gives the xanthroproteic reaction and is rendered harmless by heating to 90° C. In many ways the symptoms of spider bites resemble those produced by snake bites, so that it is probable that the spider venoms belong to that class of poisons. It is known that snake venoms are very complex mixtures and that they differ greatly in the different species of reptiles. Among the ingredients that have been found are fibrin ferment and antiferment, proteolytic enzymes, cytotoxins for red corpuscles, and neurotoxins, as well as leucocytes and endothelial cells. The marked effects on the nervous system produced by the bite of the black spiders, *Latrodectus mactans*, and other species of *Latrodectus* indicate that the venom of these animals resembles that of the cobra more nearly than the venoms of American snakes. All parts of the spider contain a toxalbumin which in some species is mixed with the secretion of the poison gland. The secretion of the poison gland produces only local symptoms, while the general symptoms are due to the presence of this toxalbumin. It is because of the toxalbumin that the bite of the *Latrodectus* is so severe as occasionally to cause death in human beings. It contains a hæmolysin called arachnolysin which acts on the red cells of man, rabbit, mouse and goose, but not on the horse, dog, sheep and guinea-pig. Some authors question whether the nervous symptoms following spider bites may not be due to changes in the blood rather than to a direct toxic effect on the nervous tissues. *References:* Wilson: *Records of the Egyptian Government School of Medicine*, 1904, p. 7. Castellani and Chalmers: "Manual of Tropical Medicine," 1910, p. 136. Browning: "Original Investigations of Spider Bites in Southern California," *South California Pract.*, xvi, 291, 1901. Davidson: *South California Pract.*, xii, 169, 1897.

Current Literature.

Indian Medical Gazette.

Vol. LV, No. 3, March, 1920.

Epidemic Encephalitis (L. P. Stephen and K. M. Bulcharidani).—The authors give a detailed description of several cases of the disease. They have found salvarsan to be very efficacious in the treatment of the condition. All the three cases treated with this drug recovered.

A preliminary note on an investigation as to the actual weight of the cataractous lens (A. E. J. Lister).—The author has investigated the subject with the assistance of Dr. Chandika Prasad Misra and Dr. Brahama Gupta. There was an enormous variation in the weight of the extracted lenses, the lightest being 110 mgr. and the heaviest 340 mgr.

Kala-azar in Europeans in the Nougong district of Assam (J. Dodds-Price).—The disease nearly always declares itself at the end of the rains or during the cold season. The death-rate among European cases has been over 72 per cent., and before the introduction of tartar emetic treatment was practically 100 per cent.

Influenza as observed in the Sambhu Nath Pundit Hospital, Calcutta (Debendra Nath Sen).—The author has constantly noted a marked diminution of chlorides in the urine, and considers this feature to be of great diagnostic importance.

The Work of a Vaccine Depot, Meiktila (J. Entrican).—This depot was started in 1902 in a very small way, but from time to time additions and extensions were made. The best calf vaccination results are obtained in the cool dry season. In the dry hot months difficulty has been ex-

perienced in keeping up the supply. This has been overcome by artificially cooling the vaccinated calves' stable and now the results obtained during the hot season are practically as good as during the cold months.

Oil Fuel Refuse Destruction (G. R. Oberai).—The author describes in detail an oil fuel refuse destructor which has given very good results. The personnel required is at least 40 per cent. less than for ordinary incinerators. The excreta and refuse are disposed of with great rapidity so that there is no smell or collection of flies about the area.

BULLETIN DE LA SOCIETE DE PATHOLOGIE EXOTIQUE. March 10, 1920.

A Contribution to the Helminthology of French Upper Guinea (A. Henry and Ch. Joyeux).—The parasites contained in the list belong for the most part to common species, but are noted with the object of assisting to define their geographical distribution.

HOST.	WORMS.
Man	*Ascaris lumbricoides* (L.)
	Trichocephalus trichiurus
	Enterobius vermicularis (L.)
	Tænia saginata
	Hymenolepis nana (v. Sieb.)
	Schistosomum hematobium (Bilh.)
	Schistosomum Mansoni (Samboni)
	Necator americanus St.
	Œsophagostomum brumpti (Raill. and Henry)
Apes	*Œsophagostomum brumpti* (Raill. and Henry)
	Characostomum asmilium (Raill.)
	Subulura distans (Rud.)
	Dirofilaria corynodes (Linst.)
	Watsonius Watsoni (Conyngham)
	Streptopharagus pigmentatus (G. Blanc)
	Cysticercus tenuicollis (Rud.)
Horses, mules and donkeys	*Strongylus edentatus* (Looss)
	Oxyurus equi (Zeder)
	Cylicostomum sp.
	Gastrodiscus aegyptiacus (Sons)
	Strongylus vulgaris (Looss)
Native cattle	*Œsophagostomum radiatum* (Rud.)
	Hæmonchus contortus (Rud.)
	Paramphistomum (probably *cotylophorum*) Fischdr.
	Fasciola gigantica (Cobb)
Zebus from Senegal	*Trichocephalus affinis* (Rud.)
	Œsophagostomum radiatum (Rud.)
	Hæmonchus contortus (Rud.)
	Setaria digitata (Linst.)
	Paramphistomum (probably *cotylophorum*) Fischdr.
	Fasciola gigantica (Cobb)
Native sheep	*Hæmonchus contortus* (Rud.)
	Fasciola gigantica (Cobb)
	Cysticercus tenuicollis (Rud.)
Sheep from Senegal	*Trichocephalus affinis* (Rud.)
	Œsophagostomum columbianum (Ourtice)
	Hæmonchus contortus (Rud.)
	Cysticercus tenuicollis (Rud.)
	Paramphistomum sp.
	Fasciola gigantica (Cobb)
Wild antelope	*Gastrothylax* (probably *minutus*) Fischdr.
	Setaria sp.
Domestic pig	*Œsophagostomum dentatum* (Rud.)
Native dog	*Ankylostomum caninum* (Ercolani)
Domestic cat	*Belascaris mystax* (Zeder)
Felis serval Scher	*Bélascaris* sp.
	Porocephalus armillatus (Wym.)
Felis pardus L. (Panther)	*Porocephalus armillatus* (Wym.)
Rat	*Golunda campanæ* (Huet)
	Hepaticola hepatica (Bancroft)
Psammophis sibilans L.	*Tetrathyridium* (Rud.), species unknown, to which the authors propose to give the provisional name of *Tethrathyridium psammophisi*.

A Simple Method of preparing an Eosinate of Borrel's Blue for Blood Examinations (E. W. Suldey).—Put 100 c.c. of Borrel's blue into a beaker with 50 c.c. of a 1 per cent. solution of eosine in water, stir well, and leave for six to twelve hours in an ordinary temperature. Pass through a fine filter, and allow the precipitate to dry. Carefully scrape the latter together and dissolve it in 150 c.c. of alcohol (90° or 95°). Leave the solution uncovered for forty-eight hours, stirring from time to time, and then pour into a well-stoppered yellow glass bottle and keep in a dark place.

Method of Use.—The blood should be dry, not fixed, and fairly fresh. Place from 3 to 5 drops of stain well over the smear and leave for one or two minutes (taking care that it does not evaporate). Pour from 30 to 50 drops of distilled water over the slide and allow to mix with the stain. Remove the slide after ten to fifteen minutes, wash, let it lie in distilled water for one or two minutes until a clear pink tint appears, and then dry. If the pink colour is not sufficiently definite place the slide for a few seconds in a 1 per cent. solution of tannin. Manson's borated blue (in the proportion of 100 c.c. for 100 c.c. of the 1 per cent. solution of eosine), or Stephens and Christophers' carbonated blue may be used instead of Borrel's blue, provided they are in good condition.

A New Methylene Eosinate (François Motais).—The following simple and effective stain was evolved in the Hué laboratories:—

Hœscht's medicinal methylene blue	1 grm.
,, eosine	0·40 ,,
Methyl alcohol	40·3 c.c.
Absolute ,, ...	80·3 ,,
Glycerine	3·3 ,,
Ammoniated silver nitrate solution (Fontana's solution)	3·3 ,,

Dissolve the blue and the eosine in the methyl alcohol, add the absolute alcohol, the glycerine (drop by drop), and finally the ammoniated silver nitrate solution. Boil for three or four minutes on a water bath, stirring vigorously. Allow to cool and filter.

Fontana's Solution.

Silver nitrate	1 grm.
Distilled water...	2 c.c.

Dissolve cold, then pour some of the solution into a beaker. Add the ammonia little by little

with a pipette, stirring with a glass rod all the time. A brownish precipitate will form, which gradually darkens, and then suddenly begins to clear. From this point the addition of ammonia must proceed with great care, and cease while the solution is still slightly opalescent. If it becomes quite clear a little more silver nitrate may be added.

Staining Technique.

Place the slide in a Laveran-Mesnil bath, sprinkle with fifteen drops of the stain, cover to prevent evaporation, and leave for not more than one minute. Turn the slide upside down, then pour 15 c.c. neutral distilled water into the bath, stir well, allow the slide to remain for from five to fifteen minutes according to the thickness of the section, wash and dry.

Blood Cultures in Bubonic Plague. Early Septicæmia in a Case of Bubonic Plague, followed by Recovery (H. J. Cazeneuve).—A sailor was admitted to hospital with high fever, acute delirium and marked inguinal adenitis. Bacteriological examination revealed no evidence of any of the acute infections endemic at Salonica. On the third day 10 c.c. of blood were taken and the plague bacillus isolated, though serum from the bubon yielded no definitely identifiable organisms. Anti-plague serum from the Institut Pasteur was administered subcutaneously. On the seventh day the temperature fell, and the patient became convalescent on the tenth day.

Questions of Salubrity and Sanitary By-laws in French Guinea (Marcel Leger).—The paper resumes the measures taken to combat malaria and leprosy in French Guinea, and seeks to correct the popular impression that the colony is exceedingly unhealthy. It shows that malaria is already disappearing from the towns, and though more difficult to handle in the country district is rapidly coming under control in the villages, where the people are intelligent and willing to co-operate.

The Ætiology of Beriberi (F. Clair).—The writer has studied beriberi in Brazil, Japan, Java, Indo-China, India, Mauritius and Madagascar. He is of the opinion that while unhealthy surroundings, insufficiently varied and poor quality food, malaria, worms, digestive troubles, &c., are all predisposing factors, the actual cause of the disease is to be sought for in an infective organism as yet unidentified.

Beriberi and Vitamine Deficiency (E. Marchoux).—An outbreak of beriberi followed an epidemic of influenza in a camp of 2,000 Annamites at Angoulême; 432 cases occurred, of which thirteen died. The men were particularly well fed, their diet consisting of fresh meat and fish, salads, dried and fresh vegetables, cheese and fruit, with decorticated rice in place of bread. The outbreak lasted from May to November, and ceased when the rice ration was discontinued. The writer considers that in this case the beriberi cannot be attributed to vitamine deficiency, and suggests the agency of some germ thriving on rice debris in the intestine. Any difficulty in the digestion of starchy matter would give time for the germ to develop and produce intoxication, and this explains why only some men were attacked and not all, as would have happened had any deficiency in diet been to blame.

How Mange in Domestic Animals should be dealt with in the French Colonies (H. Velu).—The writer gives an account of the dipping methods employed in the British colonies and America. He particularly advocates the use of Cooper's solution, which he tested on pigs, horses and mules in Morocco, and found to be most effective.

Encystment of a Cercaria of the Cercaria armata Type in a Fresh-water Turbellaria (Ch. Joyeux).—Attention was first called to the presence of the cercaria in molluscs of the genus *Planorbis atticus* (Roth) in an irrigation well in Lower Macedonia during the months of April and May. Subsequently it was found in a turbellaria, probably *Dendrocœlum lacteum* (Müll), in the same well. Though belonging generally to the *Cercaria armata* group, it could not be identified with any of the species already classified. A full description is given in the article. Circumstances connected with the well would seem to indicate frogs or toads as the animals in which the cercaria reaches adult form, though what the last stage in its development may be is doubtful.

Note on a Case of Kala-azar in a Child at Gabon (Elie Tournier).—The child, a boy of 3, had never left his native village. Both liver and spleen were enlarged, the latter enormously, and puncture enabled the identification of large quantities of typical Leishman bodies. Atoxyl was administered too late to be effective, and the patient died on the fifteenth day. This is the first case of Leishmaniosis observed in Equatorial Africa.

Plasmodium falciparum Infection and Novarsenobenzol (P. Brau and J. M. Marque).—Malarial patients at a very unhealthy military station (now closed) in Cochin China, from whose blood *P. falciparum* (sporocytes and crescents) was recovered, showed a very much more favourable reaction to novarsenobenzol than to quinine or arrhenal.

The Gametes of Plasmodium præcox and the Variable Proportion of Male and Female Elements (P. Abrami and G. Senevet).—As the result of very careful study of the blood of a non-treated case, the authors find that in the interval between two attacks of malaria the total number of crescents in the blood-stream diminishes, and that the male elements disappear more quickly than the female. They attribute the disagreement existing between writers on the latter point to lack of a definite

method of estimating probable error, and to the possibility of their investigations having been made at different stages of the disease.

The Manufacture and Uses of Essence of Niaouli (C. Nicolas).—The Niaouli tree (*Melaleuca Viridiflora*) is found exclusively, but very abundantly, in New Caledonia. The essence distilled by the natives from its leaves is mixed with oil in various proportions in France and sold under the trade name of *Gomenol*. In New Caledonia, however, it is used in a pure state, and during a long period of service in that country the writer found it of great utility as an antiseptic. He employed it with excellent results (generally pure, but on rare occasions diluted with 50 per cent. olive oil) for clean or infected wounds, for washing out fistulous tracts, abscess cavities, &c., for metritis, cystitis, &c., for burns, for all forms of external application, for inhalations, and internally.

On a further case of Amœbic Dysentery in a Dog (J. Bauche and F. Motais).—A four-year-old pointer at Hué, showing the usual clinical and microscopic signs of amœbic dysentery, was treated with emetine but died. At autopsy the lesions found appeared to show that death was due to intoxication by the emetine after eradication of the amœbæ had taken place, and the author considers that the case establishes a parallel with amœbic dysentery in man.

Concerning a case of Tetanus. Use of Dried Serum and Large Doses (C. Nicolas).—A New Hebrides stockman, showing every symptom of advanced tetanus, was given 60 c.c. of first French and then American serum (in conjunction with chloral and bromide by mouth) for two days, at the end of which time the supply ran out. On the third day a stock of dried veterinary antitoxin of English origin, at least ten years old, was discovered, and as the patient seemed in a hopeless condition this was diluted in boiled and filtered water and a subcutaneous injection of 60 c.c. administered. The treatment was repeated until the seventh day, and the patient made an excellent recovery. On a later occasion the French manager of the station was treated for tetanus in a similar manner (i.e., with dried veterinary antitoxin) and made an equally satisfactory recovery.

Hæmogregarina in a Macacus Monkey (M. Langeron).—In view of Krempf's description of *Hæmogregarina hominis* in 1917 and Roubaud's discovery of *Hæmogregarina inexpectata* in 1919, the author describes an organism which he recovered from the blood of a *Macacus cynomolgus* in 1912 but was then unable to identify. He is of the opinion that the existence of Hæmogregorina in both man and monkey is now proved, and as his own discovery resembles *Hæmogregarina hominis* and *Hæmogregarina inexpectata* but is identical with neither, he proposes to give it the name of *Hæmogregarina blanchardi* in memory of Prof. Blanchard.

Reports and Reprints Received.

C. H. Treadgold, M.D.Cantab., D.T.M. (Paris): "On a Filaria, *Loa Papionis* N. S.P., Parasitic in *Papio Cynocephalus*:" *Parasitology*, vol. xii, No. 2, March, 1920.

Prof. Camillo Golgi: "Sulla Struttura dei Globuli Rossi Dell'Uomo e di Altri Animali:" *Dal Bollettino della Societa Medico-Chirurgica di Pavia* (Anno XXXI—Fasc. 3—1919).

M. Rodriguez Castroman: "Nuévo ciéncia Antituberculosa," *De la Semana Medica*, No. 20, 1919.

M. Rodriguez Castroman: "El bacilo de Ferran y los procesos tuberculogenos:" Trabajo presentado al Segundo Congreso Americano del Nino celebrado en Montevideo del 18 al 25 Mayo de 1919.

M. Nicolle, E. Cesari, C. Jouan: "Toxines et Antitoxines." Messan and Co., Paris.

Dott. Costanza Boccadoro: "Di Alcune Speciali Formazioni (parassiti?) Che Si Riscontrano Nel Vitello Delle Uova Della Rana Esculenta:" *Dal Bollettino della Societa Medico-Chirurgica di Pavia* (Anno XXXI—Fasc. 3—1919).

Edward Jenner Wood, M.D., Wilmington, N.C.: "A Mixed infection with Tertian and Quartan Malaria occurring in a Patient with Symmetrical Gangrene," *Journal of the American Medical Association*, December 7, 1907, vol. xlix, pp. 1891-1895.

Edward J. Wood, Wilmington, North Carolina: "The Occurrence of Yaws in the United States," *The American Journal of Tropical Diseases and Preventive Medicine*, vol. ii, No. 7, January, 1915, pp. 431-449.

Edward J. Wood, M.D., Wilmington, N.C.: "The Occurrence of Sprue in the United States," *The American Journal of the Medical Sciences*, November, 1915, No. 5, vol. cl, p. 692.

A. K. Yegnanarayana Iyer, M.A., F.C.S., N.D.D., Deputy Director of Agriculture in Mysore: "The Improvement of Indian Dairy Cattle," *The Agricultural Journal of India*, vol. xiv, Part v, October, 1919.

R. Branford, M.R.C.V.S., Superintendent, Government Cattle Farm, Hissar: "Note on an outbreak of Surra at the Government Cattle Farm, Hissar, and on Cases treated," *The Agricultural Journal of India*, vol. xiv, Part v, October, 1919.

Prof. John L. Todd, McGill University, Montreal, Canada: (1) "The After-History of Trypanosomiasis in Africa;" (2) "Concerning Immunity to Human Trypanosomiasis," *New Orleans Medical and Surgical Journal*, vol. 72, No. 5, November, 1919.

Prof. John L. Todd, M.D., "The Granules of *Spirochæti duttoni*," *Bulletin de la Société de Pathologie Exotique*, tome xii, No. 9, Séance du 12 Novembre, 1919.

Original Communications.

MILROY LECTURES ON THE HIGHER FUNGI IN RELATION TO HUMAN PATHOLOGY.[1]

By Aldo Castellani, C.M.G., M.D., M.R.C.P.Lond.

Physician to the Tropical Hospital (Ministry of Pensions; Lecturer at the London School of Tropical Medicine).

Lecture II.

The higher fungi may attack any organ and system of the human body, the integumentary system being the most frequently and the nervous system the most rarely affected. It would take too much time to discuss *seriatim* the numerous mycological affections of the various systems, and I will limit myself to only touching on the following so-called internal mycoses: (1) Thrush. (2) Broncho-mycoses. (3) Tonsillo-mycoses. (4) Certain mycoses of the nervous system and organs of special sense. (5) Certain mycoses of the urogenital system.

Thrush.

It is generally stated that thrush is due to the fungus *Oidium albicans*, Robin (Syn.: *Monilia albicans*, Robin). For many years, however, I have endeavoured to demonstrate that the ætiology of thrush is far from being so simple, and that this condition, at least in the tropics, is not caused by one fungus only, but by a number of different fungi, and that in reality the term thrush does not cover one affection, but a group of clinically similar conditions due to various organisms.

The fungi I have so far isolated belong to various genera and species:—

Class: *Fungi imperfecti.* { Order *Thallosporales*—Family *Oösporaceæ*, Saccardo. { Genus *Monilia*, Persoon—Several species. { Genus *Oidium*, Link—Three species.
Sub-class: *Hyphales.* { Order *Hemisporales*—Genus *Hemispora*, Vuillemin—One species.

Class: *Ascomycetes*—Sub-class: *Protoascomycetes*—Order *Saccharomycetales.* { Family *Endomycetaceæ* Rees—Genus *Endomyces*, Rees—One species.
Family *Saccharomycetaceæ*, Rees { Genus *Saccharomyces*, Meyen—One species. { Genus *Willia*, Hansen—One species.

Fungi of the Genus Monilia, Persoon.

These are the fungi most commonly found in thrush. As regards their botanical characters, it suffices to say, from a practical point of view, that these fungi are characterized principally by the following features. In the lesions the vegetative body (thallus) is composed of mycelial threads of rather large size often showing arthrospores and numerous free oval or roundish budding yeast-like forms; in cultures, especially on solid media, mostly roundish or oval budding elements are seen, while mycelial filaments are very scarce or absent. These fungi, as a rule, ferment with production of gas, glucose, and often other sugars. The only monilias I know of which do not attack any sugar or other carbohydrate are *M. zeylanica*, Cast., and *M. zeylanoides*, Cast.

There is little doubt that the original fungus *Oidium albicans*, described by C. Robin in 1853, belongs in reality to this genus, and its correct name is therefore *Monilia albicans* (C. Robin, 1853). There is little doubt also that the term *Oidium* or *Monilia albicans* has been used in the past to cover a number of different fungi, as proved by the widely different descriptions of it given by different authors. For instance, some observers state that the organism liquefies gelatin, others deny that it possesses such action. Certain authorities describe it as coagulating milk, others as having no action on this medium.

The more important Monilia fungi I have found in thrush belong to the following types:—

M. balcanica, Cast., ferments, with production of gas, glucose only.

M. krusei, Cast., ferments, with production of gas, glucose and lævulose.

M. pinoyi, Cast., ferments, with production of gas, glucose, lævulose, and maltose.

M. metalondinensis, Cast., ferments, with production of gas, glucose, lævulose, maltose, and galactose.

M. tropicalis, Cast. (fig. 1, 2, and 3), ferments, with production of gas, glucose, lævulose, maltose, galactose, and saccharose.

M. guillermondi, Cast. (rare), ferments, with production of gas, glucose, lævulose, and saccharose.

M. macedonicnsis, Cast. (rare), ferments, with production of gas, glucose, lævulose, galactose, saccharose, and inulin.

M. pseudotropicalis (extremely rare), ferments with production of gas, lactose in addition to other sugars.

M. pseudolondinensis, ferments dextrin in addition to other sugars.

M. zeylanica, Cast. (fig. 4), does not produce gas in any sugar or other carbohydrate. This group contains the folowing species: *M. zeylanica*, Cast., *M. zeylanoides*, Cast.

M. albicans, Robin, *sensu stricto* belongs to the metalondinensis type, and I have very seldom isolated it.

I should like to emphasize the point that a large number of fungi of the genus *Monilia* have not permanent sugar reactions, they often lose some of their original fermentative properties and can be trained to ferment sugars which they do not ferment when recently isolated, and therefore, for purposes of classification and comparison, such fungi should be investigated, using only recently isolated strains (see Table I.).

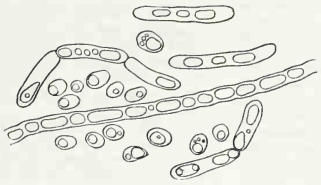
Fungi of the genus Oidium sensu stricto.—This genus is morphologically closely allied to Monilia, and mycelial threads are very abundant both in the lesions and in cultures, and budding, yeast like

[1] Delivered before the Royal College of Physicians of London.

	Glucose	Lactose	Galactose	Maltose	Lactose	Saccharose	Inulin	Dextrin	Litmus milk	Gelatine	Serum	Colour
Monilia alba Castellani 1911 ...	AG	AG	AG	AG	O	A	O	O	AC	O	O	White
M. albicans Robin 1853	AG	AGs	AG	AGs	O	Avs	O	O	AC	+	+S	,,
M. balcanica Cast. 1916	AG	As	O	O	O	O	O	O	O	O	O	,,
M. balcanica Cast. strain 2	AG	O or As	A	A	O	As	O or As	O or As	O or A	O	O	,,
M. bethaliensis Pijper 1918	AG	—	O	AG	O	O	O	O	O	O	O	,,
M. burgessi Cast. 1912	AGs	A	A	AGs	O	AGs	O	O	O / Alk	O	O	,,
M. chalmersi Cast. 1912	AG	AG	AGs	As	O	AG	AGs	O	As / Alk	O	O	,,
M. decolorans Cast. and Low 1913 ...	AG	AG	A	AG	O	A	O	A	DC	O	O	,,
M. enterica Cast. 1911	AG	AG	AG	AG	O	AG	O	As	O / Alk	O	O	,,
M. fæcalis Cast. 1911	AG	AG	AGs	AG	O	AGs	O	O	A / D Ps	O	O	,,
M. guillermondi Cast. 1910	AG	AG	A	AG	O	AG	O	O	O / Alk	O	O	,,
M. intestinalis Cast. 1911	AG	AG	A	AG	O	A	O	O	ADS	O	O	,,
M. krusei Cast. 1909	AG	AG	O	O or As	O	O	O	O	O	O	O	,,
M. londinensis Cast. 1916	AG	AG	A	A	A	A	O	O	AC	O	O	,,
M. lustigi Cast. 1912	A	AGs	A	Avs	O	AGs	O	A	As / D	O	O	,,
M. macedoniensis Cast. 1917 ...	AG	AG	AG	A or O	O	AG	AG	O	AC	O	O	,,
M. metalondinensis Cast. 1916 ...	AG	AG	AG	AG	O	O	O	O	O	O	O	,,
M. metatropicalis Cast. 1916 ...	AG	AG	AG	AG	O	AG	O	O	AC	O	O	,,
M. nabarroi Cast. 1917	AG	AG	O	AG	O	O	O	O	AC	O	O	,,
M. negrii Cast. 1911	AG	AG	AGs	As	O	AG	O	O	Avs / Alk	O	O	,,
M. parabalcanica Cast. 1916 ...	AG	As	O	O	O	O	O	O	AC	O	O	,,
M. parakrusei Cast. 1912	AG	AG	O	O	O	O	O	O	AC	O	O	,,
M. paratropicalis Cast. 1909 ...	AG	AG	AG	AG	O	AG	O	Avs	As / Alk	O	O	,,
M. perryi Cast. 1912	A	AGs	A	A	O	AGs	Avs	O	As / D, Alk	O	C	,,
M. pinoyi Cast. 1910	AG	AG	O	AG	O	O	O	O	O	O	O	,,
M. pseudo-bronchialis Cast. 1916 ...	AG	AG	O	AG	O	AG	O	O	AC	O	O	,,
M. pseudo-guillermondi Cast. 1916 ...	AG	AG	O	O	O	AG	O	O	AC or P	O	O	,,
M. pseudo-londinensis Cast. 1916 ...	AG	AG	AG	AG	O	O	O	AG	O	O	O	,,
M. pseudo-londinoides Cast. 1916 ...	AG	AG	AG	AG	O	O	O	AG	AC	O	O	,,
M. pseudo-metalondinensis Cast. 1916	AG	AG	AG	AG	O	O	AG	O	AC	O	O	,,
M. pseudo-tropicalis Cast. 1910 ...	AG	AG	AGs	O	AG	AG	O	O	ACs	O	O	,,
M. pseudo-tropicaloides Cast. 1919 ...	AG	AG	AG	O or A	AG	AG	O	O	O	O	O	,,
M. rhoi Cast. 1909	AG	AG	AGs	Avs	O	AG	O	O	As / Alk	O	O	,,
M. rosea Zenoni 1910	—	—	—	—	—	—	—	—	—	O	O	Pink
M. tropicalis Cast. 1909	AG	AG	AGs	AG	O	AGs	O	O	A	O	O	White
M. zeylanica Cast. 1910	O or A	O or A	O or A	O or A	O or As	O or A	O or Avs	O or A	ACs	O	O	Yellowish
M. zeylanica similis 1917	A	O or As	O or As	O or A	O or As	O or As	O or A	O or A	O or A	O	O	White
M. zeylanoides Cast. 1917	A	A	A	A	O or As	A	O or As	A	O or A	O	O	Yellowish

Abbreviations used in the table—A = acid. G = gas. C = clot (milk) clear (broth and peptone water); CTP = clear at first, then thin pellicle present. D = decolorized. P = peptonized (milk), pellicle (broth). Alk = alkaline. s = slight. vs = very slight. O = negative result, viz., neither acid nor clot in milk; neither acid nor gas in sugar media; non-production of indol; non-liquefaction of gelatine or serum as the case may be. + = positive result; liquefaction of medium.

FIG. 1.



Monilia tropicalis: direct from the lesions.

FIG. 2.

Monilia tropicalis: preparation from a glucose-agar culture.

FIG. 3.

Monilia tropicalis: glucose-agar culture.

FIG. 4.

Monilia zeylanica: glucose-agar culture

FIG. 5.

Oidium asteroides: from a glucose-agar culture.

FIG. 6.

Oidium asteroides.

FIG. 7.

Oidium rotundatum: from a culture.

FIG. 8.

Hemispora rugosa glucose-agar culture

FIG. 9.

Willia ascospores.

FIG. 10.

Tonsillo-mycosis due to *Hemispora rugosa*.

cells are rare. Fungi of this genus may occasionally induce an acid fermentation, but never produce gas in any carbohydrate. I have found fungi of this genus in certain cases of thrush in the tropics and in the Balkans, but so far not in England. I have isolated three species (figs. 5, 6, and 7): *Oidium matalense*, Cast., *O. asteroides*, Cast., and *O. rotundatum*, Cast. It is interesting to note that I have found the same species in cases of mycotic tonsillitis and in the expectoration of certain cases of bronchitis, while I have observed *O. asteroides* also in the stools of certain cases of enteritis.

Fungi of the genus Hemispora.—The botanical characters of these fungi I have given in my first lecture. They are characterized by the presence of abundant mycelial hyphæ, some of which are *conidiophores*. Each *conidiophore* terminates into an ampulliform or sausage-like structure, which is called *protoconidium*. The *protoconidium* later divides into a number of spore-like segments, which are called *deuteroconidia*.

So far only one species of this genus has been found in cases of thrush, *Hemispora rugosa* (fig. 8). This fungus was first isolated by me from a case of mycotic bronchitis in 1910, and in a case of tonsillitis in 1913, and observed in a case of thrush by Pijper in 1915. Two varieties can be distinguished: one liquefying gelatin, the other having no such action on the medium.

Fungi of the genus Willia, Hansen.—These fungi are characterized by the peculiar bowler-hat shape of their ascospores. I isolated a fungus belonging to this genus in Macedonia from a case of thrush in a gipsy. In sugar broths it formed a thick pellicle containing air-bubbles. It produced gas in glucose and lævulose only. Cultures on solid media contained asci with 2-4 spores of the peculiar bowler-hat-like appearance (fig. 9). The fungus seemed to be somewhat similar to *Willia anomala*, Hansen, but the investigation of it is not yet complete.

Fungi of the genus Endomyces, Link.—These fungi are on superficial examination similar to those of the genus *Monilia*, budding elements and mycelial threads being found in the lesions, and mostly budding elements in cultures. There is, however, a very important character which differentiates these fungi: in old cultures of endomyces asci are present. Only once have I come across a case of thrush due to a true endomyces, in Macedonia in 1917. I considered it to be *E. vuillemini*, Landrieu.

Fungi of the genus Saccharomyces, Meyen.—In the Balkans I found a case of thrush due to a typical saccharomyces, which I have only recently studied. Fungi of this genus are characterized by the vegative body consisting only of budding elements, and by the presence of asci in cultures. The saccharomyces isolated by me ferments with production of gas, glucose, lævulose, galactose, maltose, and saccharose. It does not clot milk, which, however, may occasionally become acid. Gelatin and serum are liquefied.

Clinical Varieties of Thrush caused by above Fungi.

I have always endeavoured to combine the laboratory and the clinical investigation of the cases of thrush observed, in order to see whether different groups of fungi are causing different types of the condition. In my experience two principal varieties of thrush may be distinguished clinically:—

(1) *White or white-greyish type.*—This is by far the most common, and in this country apparently the only one found. It is characterized by the cream-white colour of the patches.

(2) *Yellow, or yellow-brownish type.*—This is characterized by the yellowish, occasionally brownish, colour of the patches.

The first type (or white type) may be caused by any species of the genus *Monilia* (except *M. zeylanica*, Cast., and *M. zeylanoides*, Cast.), by *Oidium matalense*, Cast., by *Endomyces vuillemini*, Landrieu, and by fungi of the genus *Saccharomyces*, Meyen, and *Willia*, Hansen. The second type (or yellow variety) is caused by *M. zeylanica*, Cast., *M. zeylanoides*, Cast., *Oidium rotundatum*, Cast., and *Hemispora rugosa*, Cast.

In conclusion, I should like to say again that thrush is not caused by one species of fungus only, the so-called thrush-fungus or *Oidium albicans*, Robin, as generally stated. It is caused by a number of different fungi, some of which are botanically very far apart from each other, and belong to separate species, genera, and families.

Sprue.

Before leaving the subject of thrush I might say a few words on a very important tropical disease, which, according to many authorities, is ætiologically connected with thrush—namely, sprue. This tropical affection, very common in Ceylon, is characterized, as well known, by profound anæmia, progressive wasting of the patient, and white, frothy diarrhœa. Kohlbrügge first in 1901[1] ascribed the disease to the thrush fungus: *Oidium* or *Monilia albicans*. He made a very thorough histological study of one of his cases which ended fatally, and emphasized the fact that the fungi, in sections of the tongue, &c., had invaded the deep strata of the mucosa, the glands, and portions of the sub-mucosa. These findings were speedily confirmed by other observers, and Le Dante in 1907 suggested for the disease the term of "Blastomycosis intestinalis." During my long stay in Ceylon I investigated the intestinal mycological flora of several cases of sprue, and I found that fungi were present almost constantly. I noted the following: *M. decolorans*, Cast., and Low, *M. intestinalis*, Cast., *M. fæcalis*, Cast., *M. insolita*, Cast., *M. tropicalis*, Cast., *M. enterica*, Cast., *O. rotundatum*, Cast., *O. asteroides*, Cast. I believed the monilias to be the probable cause of the frothy diarrhœa, but I did not agree with Kohlbrügge that they were the primary cause of the malady.

Low came to the same conclusion as I did. Recently Kohlbrügge's work has been supported in a series of publications by Bahr, Ashford, and others, while Sir James Cantlie has brought forward the hypothesis that it is a deficiency disease, and Sir Leonard Rogers and Nicholl the theory that it is a streptococcus infection.

I have made tentatively the suggestion that, as is the case with dysentery, the term sprue may perhaps cover several clinically similar but ætiologically different conditions: one might be of mycological origin, another of bacterial origin, &c.

Broncho-mycoses.

Bronchial affections due to the higher fungi are quite common in the tropics, and are occasionally met with also in temperate climates. They may be classified in several groups as follows:—

(1) Causative fungus belonging to the genus *Nocardia*, Toni and Trevisan, or the genus *Cohnistreptothrix*, Pinoy: Nocardiasis.

(2) Causative fungus belonging to the genus *Monilia*, Persoon: Broncho-moniliasis.

(3) Causative fungus belonging to the genus *Oidium*, Link: Broncho-oïdiosis.

(4) Causative fungus belonging to the genus *Hemispora*, Vuillemin: Broncho-hemisporosis.

(5) Causative fungus belonging to the genus *Aspergillus*, Micheli, and *Sterigmatocystis*, Cramer: Broncho-aspergillosis.

(6) Causative fungus belonging to genus *Penicillium*, Link: Broncho-penicilliosis.

(7) Causative fungus belonging to the genera *Mucor*, Micheli; *Rhizomucor*, Lucet and Constantin: Broncho-mucormycosis.

(8) Causative fungus is a *Sporotrichium*: Broncho-sporothrichosis.

I have come across cases of all the forms I have mentioned. The severity of these affections depends a great deal on the variety of fungus present. If the condition is of nocardial origin the prognosis is very bad, if of monilia or oïdium origin the outlook is less unfavourable, though certain cases terminate fatally. If the affection is caused by a sporotrichium, a hemispora, or in general by fungi which are rapidly influenced by potassium iodide, the prognosis is good.

I may perhaps be allowed to say a few more words about three of the varieties I have mentioned.

(1) Broncho-moniliasis, and in connection with it "tea-factory and tea-taster's cough."

(2) Broncho-mucormycosis.

(3) Broncho-aspergillosis.

(4) Broncho-penicilliosis.

(5) Broncho-nocardiasis.

Broncho-moniliasis.

This variety of broncho-mycosis was described by me in 1905 in Ceylon. The condition has recently been found in many tropical and subtropical countries, and even in the temperate zone. Pijper has described cases in South Africa, and Chalmers and MacDonald and Fabrà had a number of cases in the Soudan and Egypt, while Iacono has found several cases in the south of Italy, and only a few weeks ago I found a case in this country. The condition appears to be caused by several different species of the genus *Monilia*, which I have described on other occasions (see also Castellani and Chalmers's "Manual of Tropical Medicine," p. 1886).

Clinically, a mild type and a severe type of the malady may be distinguished, with, of course, a number of intermediate cases. In the mild type the general condition of the patient is good, there is no fever, and he simply complains of cough. The expectoration is muco-purulent, often scanty, and does not contain blood. The physical examination of the chest is negative or reveals only a few râles. The condition may last for several weeks or months, and may get cured spontaneously, or continuing, may turn into the severe type.

The severe type closely resembles phthisis. The patient becomes emaciated, there is hectic fever, and the expectoration is often bloody. The physical examination of the chest may show patches of dullness, fine crepitations, pleural rubbing. This type may be fatal.

The treatment consists in giving potassium iodide to which glycerophosphates and balsamics may be associated. It is interesting to note, however, that in certain cases potassium iodide has practically no beneficial action whatever.

Tea-taster's Cough.

In connection with broncho-moniliasis, I may say a few words on the so-called "tea-taster's cough" and "tea-factory cough." In 1906 a young assistant in one of the big Ceylon firms, a tea-taster, came to consult me for a chronic cough, which he said had not yielded to ordinary treatment, and had been suspected by several medical men to be of tuberculous origin. He emphatically stated, however, that he did not believe it was tuberculosis. "I am merely suffering," he said, "from tea-taster's cough," an expression I had never heard before. The general condition of the patient was good, and the physical examination of the chest revealed only a few coarse râles. The microscopical examination of the sputum was negative for T.B.; instead I noticed microscopically some mycelial filaments and some yeast-like bodies. I inoculated several glucose-agar tubes and I grew a Monilia fungus which, at the time, I believed to be an endomyces.

How did this patient get infected? Tea-tasters, in order to judge of the quality of the various teas, not only taste infusions, but often fill their hands with the tea-leaves and bury their noses in them, sniffing them up; in this way a certain amount of tea-dust enters the nasal cavities. Now if one examines tea-dust in Ceylon, one finds that it contains fungi of the genus *Monilia*

[1] Arch. f. Schiff's u. Tropen Hygiene, 1901, No. 12.

constantly, of the genera *Aspergillus* and *Penicillium* frequently, and of the genus *Oidium* occasionally. A peculiar streptococcus is also very often present. The same organisms are not rarely found in the nasal cavities of tea-tasters, and when bronchial symptoms appear in them monilia-like fungi are present in the expectoration. It is probable therefore that the so-called tea-taster's cough is a moniliasis, especially as a guinea-pig, in the nostrils of which I insufflated tea dust regularly, died with symptoms of chronic broncho-pneumonia.

What I have said about "tea-taster's cough" applied to a great extent to the so-called "tea-factory cough." For many years planters have noted in Ceylon that the coolies doing work in the tea-factory, where the leaves are dried and there is a large amount of tea-dust floating about, after some months become weak, lose flesh, and often have a cough with muco-purulent expectoration. The planters have found by experience that these coolies must be taken away from the factory and sent to work in the field, and then the symptoms slowly disappear. I have examined some of these coolies, and their expectoration practically always contains fungi of the genus *Monilia*. I have little doubt, therefore, that the so-called tea-factory cough is a broncho-mycosis and probably a broncho-moniliasis.

Broncho-mucormycosis.

While I was in Macedonia a Serbian was sent to me with the diagnosis of T.B. The patient was very anæmic, very weak, and was losing flesh rapidly; slight fever at night. Sputum muco-purulent. The examination of the chest revealed nothing except a few coarse râles. Examination of the sputum for T.B. constantly negative; instead, a few mycelial segments were noticed on several occasions. Glucose agar tubes and other media were inoculated and a fungus was isolated, which at first showed cultural characters somewhat monilia-like; in subcultures, however, the characters of a mucor appeared; a yellowish ovoid-shaped "columella," sporangium globular, about 50 microns in diameter, of yellowish colour; spores elliptical, smooth.

How did this patient get infected? It is interesting to note that he was in charge of horses and often had to remove horse-dung. As is well known, *Mucor mucedo*, L., is extremely common in horse-dung.

Broncho-aspergillosis.

I have seen several cases of this condition in the tropics—a case in an island in the Adriatic, another in Macedonia. These two cases have been diagnosed as T.B.; from one *Aspergillus fumigatus*, Fresenius, was grown; from the Macedonian case a fungus very similar or identical with *Sterigmatacystis nigra*, Cramer, was isolated. In France, as well known, a peculiar bronchial aspergillosis is common among pigeon breeders (*gaveurs de pigeon*), who fill their mouths with grain and blow it into the mouths of the pigeons. The grain contains spores of various aspergilli and after a time most *gaveurs* become infected.

Broncho-penicilliosis.

A Serbian soldier was sent to me with the diagnosis of T.B. He was wasting and had serotine fever. Expectoration muco-purulent, occasionally bloody. Examination for T.B. constantly negative. A few mycelial threads present. A fungus was grown with the characters of *Penicillium crustatum*, L. Potassium iodide acted satisfactorily.

Broncho-nocardiasis.

In the Balkans I have observed one case of this condition, in the tropics several. The case seen in the Balkans was a young Serbian with all the symptoms of tuberculosis of the lungs; great loss of flesh, serotine fever, bloody expectoration; the physical examination of the chest showed patches of consolidation, crepitations, and pleural rubbing. The sputum contained at times some very small, whitish granules, composed of very thin branching filaments, Gram-positive, and partially acid-fast. The fungus was easily grown on maltose and glucose-agar, and in subcultures also on ordinary agar. The cultures had at times a pink-reddish colour. Gelatin was liquefied. No treatment was of any avail.

Tonsillo-mycoses.

Mycotic affections of the tonsils are far from being rare, especially in tropical countries. The more chronic conditions, especially of the crypts, associated with nocardia-like and leptothrix-like fungi, have been known for many years, but I should like to call attention to certain acute mycological affections which I have described during the last fifteen years, and which not rarely have been mistaken for diphtheria—viz., tonsillar moniliasis, tonsillar oidiomycosis, and tonsillar hemisporosis (fig. 10).

Acute Tonsillar Moniliasis.—Case 1.—Singhalese girl, about 11 years, admitted to the Infectious Diseases Hospital of Colombo with the diagnosis of diphtheria. There were white patches on the tonsils, uvula, and soft palate. The temperature was rather high (102°); the pulse frequent and of low pressure. There was swelling of the lymphatic glands at the angle of the jaw. The child developed symptoms of broncho-pneumonia and died three days after admission. (Anti-diphtheria serum was given twice by the physician in charge of the hospital.) The microscopical and bacteriological examination of the patches for the Klebs-Löffler bacillus, carried out with the usual technique, using serum-media, &c., remained negative. No bacteria of any kind were seen in the specimens directly taken from the patches, but numerous mycelial and conidial elements of a fungus were present. On serum and glycerine agar media no colonies of diphtheria or other bacteria. The fungus had all the biochemical characters of *Monilia tropicalis*, Cast.

Case 2.—A young European lady, 22 years of

age, became suddenly ill with sore throat at one of the Colombo hotels. Her medical attendant suspected diphtheria, and called me to see her in consultation. When I examined her the temperature was 101°, pulse 98; she complained of difficulty and pain in swallowing, both tonsils and uvula were covered with white creamy patches. Preparations made from the patches revealed an enormous number of yeast-like organisms and a few cocci, while no bacilli of any kind were present. This, of course, was sufficient to exclude diphtheria. On glucose agar tubes a fungus grew in pure culture with all the characters of a monilia. This monilia rendered milk slightly acid, and then decolorized it completely; did not liquefy serum or gelatin. On serum it induced a narrow zone of black discoloration all round the growth.

Acute Tonsillar Oidiosis.—European, 25 years of age; since several years in Ceylon. In November, 1914, was taken ill with severe sore throat, difficulty in swallowing, and high fever (104° F.). When I saw him, twelve hours after onset, both tonsils were covered with a white exudation, but not the uvula.

The microscopical and bacteriological investigation showed absence of the diphtheria bacillus, while a fungus was grown with the botanical characters of an oidium. Further investigation revealed it to be very similar to *Oidium matalense*.

Acute Tonsillar Hemisporosis.—I am indebted to Dr. Spaar for the clinical notes of the following case. European planter, admitted to the Kandy Hospital on May 2, 1913. The illness had started two weeks previously. Temperature on admission 101° F. Complained of severe pain in the throat and of difficulty in swallowing. Flushed face; felt extremely weak and exhausted. Voice thick and nasal. Swallowing painful and difficult. Fluid regurgitated through nostrils. There was a profuse flow of saliva. The muscles of the neck were rigid, submaxillary glands enlarged and painful. The patient was unable to open the mouth wide. Tongue thickly coated and dry; soft palate swollen. Greyish membranes were present on the left tonsil, left anterior pillar, and soft palate. Diphtheria antitoxin (2,000 units) injected the same day into the flank and a spray of hydr. perox. prescribed. During the next four days the general condition improved, but the white-greyish membrane in the cleft between the left tonsil and the left anterior pillar was still very evident. Nine days after admission there was still a small whitish patch visible, but the patient felt quite well and was discharged the following day.

Dr. Spaar sent swabs taken with all possible precaution to me for examination. In smears made from the swabs no bacilli were seen, a few cocci were present, and numerous large mycelial segments of a fungus. Serum tubes and glycerine-agar tubes were inoculated as usual, and gave the presence of mycelial threads, also several sugar-agars. The serum and glycerine-agar tubes did not show any growth of the diphtheria bacillus; instead there was growth of a fungus with a peculiar crinkled surface which I had found previously in 1909 in a case of bronchitis. I was uncertain about its classification, and placed it temporarily in the genus *Monilia*, and called it *Monilia rugosa*. However, I sent cultures of the fungus to Professor Pinoy, of the Pasteur Institute, who, after a long botanical investigation, came to the conclusion that the organism belonged to the genus *Hemispora*. The correct name of the fungus became therefore *Hemispora rugosa* (Cast.). During the war I have seen several cases of acute tonsillomycosis in the Balcanic-Adriatic zone, and recently a case in Paris, and a case in this country.

Mycotic Affections of the Nervous System and of Organs of Special Sense.

In 1904, from the pus of a cerebellar abscess, I grew an extremely delicate fungus, a nocardia which was Gram-positive and partially acid-fast. No club-like formations were present in microscopical preparations. This nocardia grew comparatively well on sugar media, very slowly and scantily on ordinary agar. On all media the colonies had a black pigmentation. Abscesses of the brain and cerebellum due to true actinomyces have been described by several authors. In cases of general infections due to saccharomyces, monilia, and endomyces-like fungi, abscesses containing such fungi may be found in the brain and spinal cord, as in other organs of the body.

Organs of Special Sense.—Mycological affections of the eye may be classified as follows: Due to species of genus *Nocardia* and genus *Cohnstreptothrix*, ocular nocardiasis. Due to various species of—

Genus *Saccharomyces*, *Cryptococcus*, *Endomyces* } — Ocular blastomycosis.

Due to fungi of genus *Monilia*, ocular moniliasis.
Due to fungi of genus *Oidium*, ocular oidiomycosis.
Due to fungi of genus *Aspergillus* and *Penicillium*, ocular aspergillosis and penicilliosis.
Due to fungi of genus *Sporotrichum*, ocular sporotrichosis.
Due to fungi of genus *Glenospora*, ocular glenosporosis.

The commonest mycological affection in Ceylon is moniliasis. I have seen several cases in Singhalese children of a conjunctivitis apparently due to a monilia; the conjunctiva was highly inflamed, there were photophobia and purulent discharge. The microscopical examination showed in addition to pus cells, numerous yeast-like bodies. No gonococci or any other bacteria were present. Agar and various sugar-agar tubes were inoculated with the pus, and a monilia fungus was grown. It is to be noted that not rarely, at least in the tropics, spores of various fungi are found in the slight secretion which so often collects at the angles of the eyes even in normal people, but these spores do not, apparently, usually give rise to any symptoms.

Rhinomycoses.—Yeast-like and other fungi are often observed in the nasal mucus; they may play only a saprophytic rôle or they may give rise to an inflammation of the mucosa. In Colombo a little

native boy was brought to me by his parents, who stated that he had been suffering for the last three months from repeated attacks of severe sneezing, and that they had observed that on blowing the nose minute black dots were coming out in the mucus. Microscopical and cultural investigations showed this case to be one of aspergillosis due to *A. niger*. In the literature cases of aspergillosis of the nose due to *A. glaucus* (De Bary) and *A. fumigatus* (Fresenius) have also been described.

Otomycoscs.—Various fungi may be present in the external auditory canal without causing any symptom. In some cases, however, the fungus multiplies abundantly, and may be the cause of a local inflammation or may apparently facilitate the formation of a wax plug. In several cases I have found a monilia which I have called *M. rhoi*. In two cases of otomycosis I have found a fungus belonging to the family *Mucoracex*, *Lichteimia ramosa* (Lindt, 1886). It was present in great quantity, and the patient complained of tinnitus aurium and deafness. It is interesting to note that this fungus is found often in the nasal mucus of horses, and both my cases were Tamil *muttus* (horse-keepers). Various authors (Siebenmann, Boke, Huckel, &c.) have recorded cases due to *Lichteimia corymbifera* (Cohn), *Rhizomucor septatus* (von Bezold); Maggiora and Gradenigo found *Saccharomyces ellipsoides* (Rhees) in a case of chronic otitis media. The same authors found a new species of saccharomyces (*S. roseus*) in the Eustachian tube.

Aspergillomycosis of the ear is comparatively frequent; I have seen several cases in Ceylon, apparently due to *A. fumigatus* (Fresenius); Cramer observed *A. niger* (von Tiegham); Wreden, *A. flavus* (De Bary); Siebenmann, *A. repens* (De Bary); and *A. nidulans* (Eidam). Fungi of the order *Basidiomycetes*, family *Ustilaginex*, have also been observed; *Ustilago carbo* and *Tilletia levis*. Of the order Hyphomycetes, *sensu stricto*, *Tricothecium roscum* (Persoon, 1801) has been observed in a few cases.

I may here mention that the best treatment I have found for the various forms of otomycosis is syringing with hydrogen peroxide 2 parts and alcohol 1 part.

Certain Mycoses of the Genito-urinary System.

Urethritis of Hyphomycetic Origin.—In the tropics and in the Balkans I have come across several such cases, which in my experience may be classified as follows:—

(1) Discharge whitish or yellowish—the causative fungi generally belong to the genera *Saccharomyces*, *Monilia*, *Cryptococcus*, *Oidium*.

(2) Discharge dark brownish or greenish-black, or black. These cases are generally due to fungi of the genus *Cladosporium* (*Foxia*), *Aspergillus*, *Penicillium*.

(3) Discharge reddish or pinkish: Generally due to the red-pigment-producing fungi of the genera *Cryptococcus*, *Saccharomyces*, and *Monilia*. At times two organisms are found: a higher fungus such as a monilia, and in symbiosis with it a red-pigment-producing coccus or bacillus.

I may quote the following cases illustrating the various clinical types I have mentioned:—

Mycotic Urethritis with Yellow Discharge.—A young Serbian officer in Macedonia consulted me for a fairly abundant purulent urethral discharge. The patient was greatly distressed; he was engaged and believed he was suffering from gonorrhœa, though he denied having exposed himself to infection. I examined the secretion; no gonococci present; instead a very large number of yeast-like cells and a few mycelial filaments could be seen. The cultural investigation showed presence of a monilia very similar to *M. krusei*. I prescribed a mixture containing pot. iod., soda bicarb., glycer., syr. of tolu, and irrigations with a solution of perchloride of mercury 1 in 20,000. The discharge disappeared completely within ten days.

Black Mycotic Urethritis.—An old Tamil coolie came to the Colombo Clinic in January, 1906, complaining of black urethral discharge dating from several months back. He stated that he had not had sexual contact for several years. The secretion was blackish and contained numerous small granules, which on microscopical examination were seen to consist of mycelial threads and spore-like bodies. Various sugar media were inoculated and a fungus was grown, producing a black pigmentation, and very similar also in other characters to *Cladosporium mansoni* (Cast.). In two other clinically similar cases, one in a native and the other in a European, I found aspergillus-like fungi.

Red Discharge.—A little Singhalese boy, 6 years old, was brought to my clinic in Colombo by his parents because they believed he was passing blood from the urethra. The discharge, examined microscopically, consisted of some leucocytes and numerous budding cells. Several sugar-agar tubes were inoculated and a red-pigment-producing cryptococcus was grown. The child was given an alkaline mixture, and instillations of diluted glycerine of borax were carried out. This, however, did not improve the condition. Urethral injections of a solution of perchloride of mercury, 1 in 20,000, were then made and a speedy cure resulted.

Very similar mycological conditions of the female genito-urinary organs may be observed, and cases of vaginitis and vulvo-vaginitis due to fungi of the genus *Monilia*, *Cryptococcus*, *Aspergillus*, *Penicillium*, and *Cladosporium* have been recorded; and as the same fungi are found in urethral and vaginal discharge, it cannot be excluded that in certain cases these mycological infections may be contracted by sexual intercourse. When the monilia-like and saccharomyces-like fungi are the causative agents two clinical varieties may be distinguished. In some cases thrush-like patches are present on the mucosa (vaginal thrush); in others no such patches are present, but the discharge is purulent, very thick, and, in my experience, these latter

LONDON SCHOOL OF TROPICAL MEDICINE.

62nd Session. February—April, 1920.

Back Row (Left to Right).—N. Nedergaard, M. Bernard Foster, J. Gray (*Sts. Settlements Med. Ser.*), E. G. Mack (*Ceylon Med. Ser.*), G. Warren (*Laboratory Assistant*), L. G. Cummings (*Med. Ser., Nigeria*), C. Basile (*Prof. Parasitology, Rome*), G. A. Prendo (*M.D., C.C. Hosp., Malta*), A. Y. Cattin, W. P. Hogg, M.C. (*Capt. I.M.S.*), J. A. Cruickshank, M.C. (*Maj. I.M.S.*), J. S. Armstrong.

Second Row.—E. J. Wood, W. Russell Square, M. Jackson (*W. African Med. Ser.*), E. Forrester Paton, J. S. Maxwell, H. R. Dive, M.C., E. U. MacWilliam, M. K. Abdul Khalik (*Cairo,*) A. K. Cosgrave, M.C. (*U. M. States Med. Ser.*), A. L. Gregg (*Med. Supt. of Hospital*), J. Fanstone, H. E. Whittingham (*Major R.A.F.M.S.*), J. R. C. Stephens (*W. African Med. Ser.*), A. W. M. Harvey (*Lt.-Col. I.M.S.*).

First Row.—N. Chena, C. M. Yevers (*Demonstrator in Helminthology*), Prof. R. T. Leiper (*Director of Helminthology*), Miss Turner (*Research Assistant in Helminthology*), Miss E. M. Svensson, Miss S. K. G. Stuart, Dr. P. Manson-Bahr, D.S.O. (*Lecturer*), Dr. G. C. Low (*Lecturer*), Prof. A. Castellani, C.M.G. (*Lecturer*), Dr. L. W. Sambon (*Lecturer*), T. H. Vaughan, Esq. (*Lecturer*), J. H. Thomson (*R.A.M.C. Demonstrator in Tropical Pathology*).

On Ground.—G. A. S. Madgwick, J. R. Crolius (*R.A.M.C.*).

Absent.—M. Wong, D. Schokman (*Ceylon Med. Ser.*), S. A. Eldanb, C. H. Brangwin.

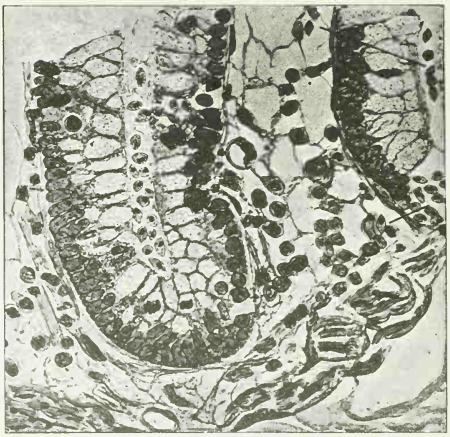
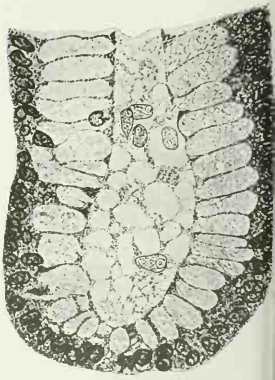


FIG. 1.



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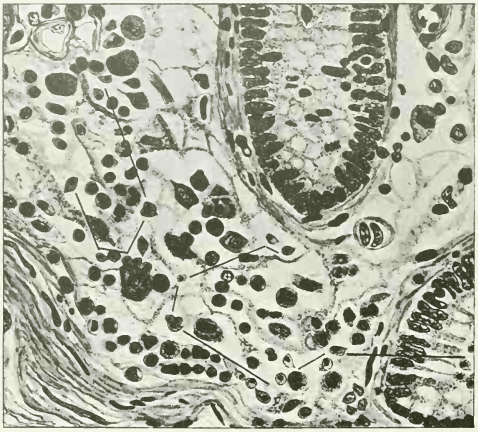

FIG. 2.

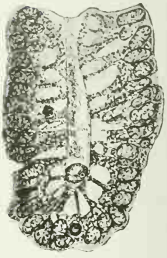

FIG. 4.

To illustrate a paper on "Histological Observations on the Possible Pathogenicity of *Trichomonas intestinalis* and *Chilomastix mesnili*, with a Note on *Endolimax nana*, by C. M. WENYON.

cases have not rarely been mistaken for gonorrhœa. In 1914 the surgeon in charge of the Colombo Lying-in Home had a case in which a pelvic operation was urgent; a thick purulent vaginal discharge was, however, noted, and he felt inclined to postpone the operation. A specimen of the discharge was sent to me with the request to examine it for gonorrhœa. No gonococci, however, were found, instead an enormous amount of mycelium and conidial elements. Further investigation revealed the fungus to be *Monilia pinoyi*, Cast. Cases of hypomycetic vaginitis are found, though not so frequently, in temperate climates, and Taylor and myself have placed on record several such cases. It must be added, however, that finding fungi in vaginal mucus is nothing new; one may read in the *Lancet* of as long ago as 1840 (p. 448) a paper by Wilkinson with the following title: "Some Remarks upon the Development of Epiphytes with the Description of a New Vegetal Formation found in connection with the Human Uterus."

HISTOLOGICAL OBSERVATIONS ON THE POSSIBLE PATHOGENICITY OF *TRICHOMONAS INTESTINALIS* AND *CHILOMASTIX MESNILI*, WITH A NOTE ON *ENDOLIMAX NANA*.

By C. M. Wenyon,

Director of Research in the Tropics, Wellcome Bureau of Scientific Research.

The question of the pathogenicity of the intestinal flagellates of man is a problem which still awaits solution. It is a well-known fact that these organisms are encountered most frequently in diarrhœic stools, and their presence there, sometimes in enormous numbers, has naturally led some to regard them as pathogenic agents. As they occur in diarrhœa and are rarely found in the formed healthy stool it naturally comes about that as the diarrhœa gives place to the normal evacuations the flagellates disappear, and what is more natural than to conclude that with this disappearance recovery has taken place? A dose of salts, however, will show that these deductions are not well founded, for the liquid stool resulting may contain as many organisms as during the attack of diarrhœa. It may be necessary to repeat the salts on two successive days to produce the flagellates, as I saw in a case recently. It must be admitted, therefore, that the pathogenicity of the intestinal flagellates still awaits absolute proof, even though the work of Esconcl and others seems to have convinced those observers that this is the case.

The presence of an organism of a more or less striking character in large numbers is in itself no proof that such an organism is pathogenic. Quite recently Delamere (*Bulletin et Mémoires de la Société Médicale des Hôpitaux de Paris*, June 12, 1919) has noted spirochætes in enormous numbers in certain cases of diarrhœa, and he attributes the disorder to their presence. Anyone who has examined stools to any extent must have met with this condition, and I myself have frequently seen stools simply swarming with spirochætes. Similarly, the presence of spirochætes in large numbers in the sputum is again no proof of a spirochætal bronchitis. The mouth constantly harbours several species of spirochæte, and it would not be surprising if under certain conditions these organisms spread to the bronchi or intestines. They are accused because they are easily recognized, and it would be just as logical to blame any of the less striking bacteria which are present at the same time.

Within the last few weeks I have seen *Trichomonas* in a case of tonsillitis. There was a bead of yellow pus protruding from one of the follicles. This was removed by means of a platinum loop and examined in saline. Fair numbers of *Trichomonas* were present, and following the methods of some observers, I would have been justified in describing a new disease, *Trichomonas tonsillitis*.

The truth of the matter is that such hasty conclusions are unscientific. The question of the pathogenicity or harmlessness of an organism requires very careful investigation and experiment, and until this is carried out no one can know whether any of the above-named organisms are pathogenic or not.

In order to obtain some light on the behaviour of the flagellates in the human intestine it is necessary to examine them there. They are usually seen only in the stool. To this end, during the epidemic of influenza in Salonika in September, 1918, a certain amount of material was collected. The cases had all died of pneumonia complicating the influenza. At the autopsies the contents of the large intestine were searched for a flagellate infection, and if one was found the gut was preserved in Zenker's fluid for future investigation. Before fixing the intestine the gut contents were examined at various levels.

Five cases of *Trichomonas* infection and three of *Chilomastix* (*Tetramitus*) were observed. With the exception of one *Trichomonas* infection the flagellates were limited to the large intestine. In the one case the *Trichomonas* extended into the small intestine and were found over the lower two or three feet, but not higher up. In no case were flagellates seen in the appendix. In three of the *Trichomonas* cases, including the one where the infection extended to the small intestine, the flagellates were present over the whole large intestine and cæcum. In two cases the infection was limited to the lowest part of the large intestine, even though in one of these the flagellates were present in very large numbers.

Of the three *Chilomastix* cases two had a general infection of the large intestine, and in one it was limited to the lower part.

There were no noticeable lesions of the intestine which one could attribute to the flagellates. In one case there were small submucous hæmorrhages

in the cæcum, but these were readily accounted for by the toxæmia of the pneumonia from which the cases died.

Escomel (*An. de la Fac. de Medicina*, September and October, 1918, Arequipa, Peru) has described various forms of *Trichomonas* dysentery. He gives photographs of the altered conditions of the intestine and even of the liver. From what one can make out from the photographs, it appears that the lesions depicted could very well be accounted for on the assumption that they are chronic bacillary dysentery cases. At any rate, the pictures resemble fairly closely the conditions one is familiar with in the old chronic dysenteries of a bacillary nature. It is not surprising that often a *Trichomonas* infection should run concurrently with a bacillary one, and in fact one has often seen such double infections. However, in the five cases described in this paper there were no lesions of the intestine comparable with those described by Escomel.

On histological examination the general distribution of the flagellates as detailed above was confirmed. There was a complete absence from the appendix, and only in the one *Trichomonas* case were they seen in the small intestine. In the large intestine the flagellates were distributed over the surface of the mucosa, but their exact relation to this was not as clear as it might have been owing to the usual post-mortem loss of the superficial epithelium.

The flagellates were also found in the lumen of the glands of Lieberkühn and in some of the *Trichomonas* cases in large numbers. In the case of *Chilomastix* never were there more than half a dozen flagellates seen in a single gland. In all but one case the flagellates were not found in any other situation. In one *Trichomonas* infection it was noted that the lumens of the glands were particularly full of flagellates, and on studying these more carefully definite ruptures of the gland epithelium could be made out, and the *Trichomonas* were evidently passing through these. It was further noted that the flagellates were scattered about in the inter-glandular loose connective tissue, so that there was a definite invasion of the tissues of the gut. Unfortunately only the upper part of the large intestine and cæcum of this case was kept, but wherever a part was sectioned the same condition was discovered. There never appeared to be an extension of the invasion beyond the mucous layer. Furthermore, there did not seem to be any reaction on the part of the tissue as regards cell proliferation or invasion. The *Trichomonas* were there distributed regularly all through the tissue, and either they had been there only a short time, or they produced so little irritation that no tissue reaction had taken place.

The figures in the plate show the condition of affairs quite clearly. The ruptures in the epithelium through which the *Trichomonas* are passing occur always at the lower end of the glands.

A similar condition was noted by Hadley, who has described an invasion of the wall of the intestine by *Trichomonas* in turkeys (*Journ. Med. Research*, March, 1919). The disease known as blackhead is attributed to this infection. The *Trichomonas* invade the glands of Lieberkühn and Hadley believes they commence their passage through the gland epithelium by penetrating the empty goblet cells. Such a channel seems highly probable, and it is possible that in man, too, the primary opening through which the *Trichomonas* pass is a broken-down goblet cell. Hadley noticed also that it was only at the fundus of the gland that this breaking through took place. Dr. Stevenson has shown me sections of the cæcum of guinea-pigs where the *Trichomonas* have penetrated beneath the epithelium, but in this case it is the inter-glandular epithelium on the surface of the intestine through which the flagellates have migrated.

The question at once suggests itself: Is it possible that this invasion has occurred post-mortem? It was noted in only one case, but this was the best one as regards preservation of the tissue. There was little post-mortem change, while in the other cases, where post-mortem degeneration was more marked, the *Trichomonas* could not be found in the tissues If they had been there they would have been recognized, as they were easily seen elsewhere.

That *Trichomonas* will pass from the intestine during life has recently been clearly demonstrated by Chatton (*C.R. Soc. Biol.*, No. 3, 1920), who was able to obtain a culture of it from the blood of a gecko which had an intestinal infection of the flagellate.

In the case under discussion the invasion was so extensive that it is difficult to attribute it all to post-mortem change. I am inclined to regard it as an ante-mortem invasion. There is so little tissue reaction that either it has occurred only a short time before death or the *Trichomonas* cause no appreciable irritation.

In one *Trichomonas* case there was a concurrent infection with *Endolimax nana* (*Entamœba nana*). This amœba occurred only in the lower part of the large intestine and, as in the case of the flagellates, it invaded the glands of Lieberkühn. One of the figures shows an amœba at the fundus of the gland. There was no evidence that it could wander beyond the limits of the lining epithelium.

The present paper therefore shows that *Trichomonas* may invade the tissues of the intestine but whether this is evidence of its pathogenicity or not future work alone will show. So little is known at present that any expression of opinion would be merely valueless guess work.

Description of Plate.

The illustrations are photographs of coloured drawings which are now in the Museum of the Wellcome Bureau of Scientific Research.

Fig. 1.—Portion of two glands of Lieberkühn in the cæcum, showing *Trichomonas intestinalis* in the lumen of the glands and also passing through the ruptures in the epithelial lining. Two *Trichomonas* are to be seen in the connective tissue.

Fig. 2.—The inter-glandular connective tissue invaded by *Trichomonas*. The black line indicate the flagellates.

Fig. 3.—*Chilomastix mesnili* in the lumen of a gland in the lower large intestine.

Fig. 4.—*Endolimax nana* in the lumen of a gland in the lower large intestine.

(Magnification of drawings about 700 diameters.)

Notes and News.

LONDON SCHOOL OF TROPICAL MEDICINE.

The following students gained the School Certificate at the termination of sixty-second session (February-April, 1920): H. E. Whittingham, A. K. Cosgrave, A. Khalil, E. J. Wood, E. Forrester-Paton, J. Fanstone, E. G. Mack, W. P. Hogg, J. S. Armstrong, J. R. C. Stephens, M. Wong, G. A. S. Madgwick, G. A. Frendo, C. Basile, M. Jackson, E. U. MacWilliam, N. Nedergaard, H. R. Dive, J. R. Crolius, A. Y. Cantin, D. Schokman, C. H. Brangwin, J. Gray.

The first five obtained the certificate with distinction.

The "Duncan" Medal was awarded to Dr. H. E. Whittingham.

Tardy Post-arsenical Jaundice (Sicard, *Bulletins de la Société Médicale des Hôpitaux*, October 24, 1919).—The drug is responsible for the jaundice that develops during treatment. Five instances occurred among 100 cases of chronic syphilitic disease of the nervous system treated by their method of small frequent (every day or every second day or third day) intravenous injection of 0·15 gm. of (French) neoarsenical to a total of thirty to fifty injections. The drug was suspended when the jaundice developed in all but one case, and this case was the only one that proved fatal. In two of the five cases the drug was being given for some pathologic condition other than syphilis, there being nothing to suggest either inherited or acquired syphilis. Among the other arguments presented is that the azotemia slowly and progressively increases under the neo-arsphenamin and for some time after its suspension. A further argument is offered by recent cases in which fatal hæmorrhages followed a course of neo-arsphenamin, accompanied in one case with jaundice. These symptoms developed six weeks after the course (total dose 8·50 gm. in six weeks at five day intervals). Necropsy revealed acute yellow atrophy of the liver. Syphilis is not responsible for the jaundice and frequent small doses are without any signs of anaphylaxis. It is the most reliable and harmless means for administering a given amount of the drug in a given period, far safer than by weekly injections.

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THE JOURNAL OF

Tropical Medicine and Hygiene

MAY 15, 1920.

WHEN TROPICAL RESIDENTS CANNOT TAKE QUININE.

THE question of quinine idiosyncrasy is perhaps more worthy of consideration than we are inclined to think or believe. So far as it has been investigated, we merely know that quinine does cause a

hæmoglobinuria in a certain percentage of individuals resident in tropical countries, but whether due to previous malaria infection or not is not so clear. We do know that quinine does cause hæmoglobinuria in Britain in a minute and infinitesimal number of people who have never left the country, and therefore amongst those who have presumably never had malaria nor any other periodic fever. Most of these have been given quinine in small "tonic" doses, say ½ grain in amount, yet the hæmoglobinuria syndrome has occurred.

It would appear, however, that the condition occurs to a much greater extent amongst white residents in the tropics than amongst residents in Britain. This may be due to one of three causes, viz., climate, previous infection by malaria, or the larger doses given. As regards climate, which it is the fashion to disregard, it must be remembered that the kidney in the tropics is subjected to much more severe strain than in Britain. The skin does so much work in warm climates that the concentration of urine results to a marked degree; and even the morning and evening flushings obtained by drinking copiously of fluids at these times do not counteract the concentration. This combined with the excretion of quinine no doubt affects the kidney tubules, and may thereby induce disturbances ending in either a hæmoglobinuria or an actual hæmaturia. In the tropics hæmoglobinuria is presumed always to have been preceded by malarial ailments and the taking of quinine by quantities multiplied at times ten-fold over and above home dosages. When we are informed that "the patient cannot take quinine," we are not always told what is meant by the phrase. If it is that the patient is upset *generally* by quinine taken at the time of a febrile attack, the patient is apt to blame the drug rather than the disease. This is, of course, a statement to be disregarded scientifically, because many people blame the doctor's drugs for their feelings, and attribute them to anything but the evils the germs of the disease are giving rise to. If, however, the impossibility to take quinine is due to a hæmoglobinuria it is a different matter and must be dealt with seriously.

The inability to take quinine is generally discovered when the tropics are reached. The medical examiner at home is asked to report upon a candidate as to his fitness to go to the tropics; it is evident that if the question of the candidate being able or unable to stand quinine has to be settled, then all candidates must have quinine given them for a certain definite time and in big doses. This is not the case merely of old tropical residents in whom quinine has been known to produce hæmoglobinuria as to whether they should go back to the tropics, and in whom quinine taking at home has been followed by a recurrence of hæmoglobinuria. The answer to such cases is in the negative of course. When, however, a young man or young woman of, say, one or two-and-twenty comes up for examination as to fitness to live in a warm climate, are we to insist that large doses of quinine be given for, say, a week before deciding? This might be resented by candidates or others wishing to go out, and it really seems a rather "thorough" line of investigation to say the least of it. It may be said that this is not necessary; better wait and see whether the patient can stand quinine when he gets malaria. This is too late, for the patient, if he or she cannot take quinine, has to be sent home, it may be within a month or two after arrival. The patient's life may be in jeopardy owing to the fact of intolerance; and the loss to the bank or firm that sent him out may amount to several hundred pounds.

On the other hand, it may be argued that all people approaching a malaria-infected locality should have been given quinine previously as a prophylactic measure; and if the quinine did not agree—that is, caused blackwater—he should be sent back. But here again he has gone a long and expensive journey before this was known, and as the evidence of blackwater resulting from quinine taking necessitates his going home again, the loss to the firm is just the same as regards the outlay and the passage money—an item of £200 or £300 it may be, or more.

Following this line of argument to its bedrock conclusions, it would seem that the test by quinine before leaving Britain is the only measure of settling the question satisfactorily. Admitted that this is agreeable to all concerned, it would further mean that the candidate would have to be submitted to a few days' test by giving, say, 5 to 10 grains of quinine daily and *watching* the effects; for those anxious to go abroad are quite capable of hiding the fact that quinine does not agree. If this fact were declared a man would lose a good appointment; a wife could not join her husband, nor a young girl go out to be married. All sufficient reasons for attempting deception. These candidates would have to be kept in surveillance in a home for, say, a week to ensure reliable evidence of fitness or unfitness, a condition of things which is scarcely likely to be submitted to with equanimity.

After all is the inability to take quinine so general? In a long experience of tropical patients of thirty-five years, the writer has only found one person with whom quinine seriously disagreed. It was the case of a married woman related in this journal by the writer a few months ago. She was married to a man whose area of work was on the West Coast of Africa. She had never been out with him; but he, having obtained suitable accommodation, was anxious to take her with him. His wife said she could not take quinine as it caused a furious eczema of the skin, attended by fever and an illness which lasted a whole week. So seriously did it affect her that the writer, after administering a small dose of quinine, had to forbid her going. This, however, was not blackwater, and the writer has never seen blackwater result from the ingestion of quinine unless the patient had malaria previously; and of these only once in China did he

find quinine cause hæmoglobinuria in a white man —a traveller who had been in Indo-China.

To those susceptible to quinine poisoning it does not require a large dose to bring about symptoms. In the woman reported above who got fever, eczema and severe illness, the effects were produced by one dose of ½ grain of sulphate of quinine. But how many hundreds of thousands of people in Britain have quinine in small doses given them in the course of the year and no untoward symptoms result? The whole question seems straining at a gnat; and the fact seems to be that with no previous malaria there will be no blackwater, but there may be untoward symptoms of a disagreeable kind, but in no sense dangerous.

The other great question involving responsibility on the part of the examining physician as to fitness to go abroad is the effect of quinine on the ear and hearing. Of course many candidates come forward with the history of ear troubles in childhood, with not infrequently (*a*) a history of discharge from the ear at intervals; (*b*) a continuous small amount of discharge; (*c*) evidence of a mastoid operation having been done; (*d*) a ruptured tympanum; (*e*) deafness from shell shock, and a number of aural lesions of more or less significance. The rule the writer follows is to send these candidates for going abroad to an ear specialist before deciding, and in every case thus dealt with the specialist declares that it is quite safe to send them abroad. The results of their going abroad for better or for worse the writer has had no means of ascertaining, but it is a matter that requires elucidating by tropical practitioners in the countries where these men reside.

If we were to decide in which class of candidates it is most necessary that the quinine test for toleration should be enforced before going abroad, it is in ear troubles old or recent.

The whole question turns upon whether we are dealing with it from a prophylactic or a treatment point of view. As a prophylactic we know of no substitute for quinine, but when we speak of treatment the matter is not so limited. There are many modifications of the form in which the alkaloid of cinchona may be given. Of the several varieties of quinine salts in our pharmacopœias and the various preparations from the cinchona bark, such as decoction of cinchona, tincture of cinchona, and a multitude of allied preparations, one preparation —the tinctura antiperiodica—Warburg's tincture—was in use for some 4,000 years before Warburg added quinine to it some 40 years ago. Without the quinine there is nothing to prove that any one of its many ingredients, some twenty-one in number, were fatal to the malaria parasite, although several, being "bitter tonics," as they are officially classified, may have that power to some extent.

Thus picrorrhiza rhizome as a liquid extract and tincture is known to have distinct antiperiodic power, although not so active as quinine. (J. M. Bruce's "Materia Medica.")

As coadjutors to quinine in the treatment of ague we have arsenic, opium, ipecacuanha and mercury, each ingredient of which serves a useful purpose, but as destroyers of the malaria parasite none are by themselves efficacious.

The conclusion is, therefore, that if we wish to ascertain positively if a candidate for the tropics is or is not likely to stand quinine, the only reliable way to test the matter is by administering quinine in doses of not less than 5 grains a day for three days before leaving British shores. Be this as it may, one thing seems imperative, namely, that the quinine test should be applied to all persons with aural defects of any kind before sending them to a malarial district.

J. CANTLIE.

Annotations.

Slow Evolution of Peritonitis following Perforation of Typhoid Ulcer (P. Gautier and P. Brutsch, *Rev. Med. de la Suisse rom.*, December, 1919).—The authors report a case of peritonitis following perforation of a typhoid ulcer in a male patient aged 26, in which an interval of a month occurred between the perforation and death. At the post-mortem an adhesive peritonitis was found localized in the right iliac fossa. The intestine presented multiple perforations, including one in the colon. The mild character of the onset was a striking feature in the case, the patient being able to continue his work for a fortnight, when signs of perforation suddenly developed. The peritonitis due to the perforation became rapidly localized, but from time to time an exacerbation of the symptoms occurred probably owing to a fresh perforation. Various hæmorrhagic manifestations were observed, namely, intestinal, renal, and cutaneous hæmorrhages. The patient showed a considerable loss of flesh during the month which elapsed between the perforation and his death.

Optic Neuritis following Typhus Fever (V. Arnold, *Wien. klin. Woch.*, September 4, 1919).—The author, eight years ago, found optic neuritis in eight out of fourteen cases of typhus, and since then he has examined 244 further cases, and has noticed the condition in 144, viz., 59 per cent. The tenth to twelfth day was the usual date of the appearance of morbid changes in the optic disc, this coinciding, more or less, with the last days of high fever. At this period the rash has often almost or completely disappeared, and therefore the appearance of the optic disc is, in the author's opinion, of great assistance in the diagnosis of typhus.

The changes seen in the optic disc are characterized by reddening and blurring, the sharply defined outlines of the healthy disc being partially obscured. The veins are distended and tortuous, but there is little or no change in the appearance of the arteries. The outline of the margin of the disc is also blurred owing to œdema. In most cases a fall in the temperature to normal is followed by complete disappearance of the optic neuritis; but at times this survives all the other complications of typhus.

Castellani's Bronchospirochætosis and its Treatment (*Najib Farah, Presse Medicale*, December 17, 1919).—The author reports from Egypt ten cases of this disease, and states that in Alexandria it is very common among both the natives and Europeans. The *Spirochæta bronchialis* occurs in large numbers in the sputum, and is readily stained by the Ziehl method, with carbol gentian violet, with crystal violet, or the Fontana-Tribondeau silver nitrate method. It is negative to Gram's. The ten patients ranged in age from twenty to forty-five years. Eight patients had had a chronic cough, while two were acute cases. General health seemed unaffected, and all patients complained of a sense of oppression in the chest. Cough was most pronounced in the evening, at night, and on awakening. Expectoration varied from slight to copious and mucopurulent; in seven instances the sputum was bloody or blood-streaked. Acute cases began with chills, fever, headache, and bronchitis, and resulted in a prolonged state of prostration. Hæmoptysis was rather frequently observed. Tubercle bacilli were uniformly absent. In the treatment, successful results were obtained by intramuscular injections of iodine in the form of lipiodol, a preparation similar to iodipin and containing 54 per cent. of pure iodine in oil of poppy. Five to ten daily injections of two mils were given, followed by ten to twenty injections at intervals of two or three days, according to individual tolerance. Injections were made in the buttock. No manifestation of iodism was noted, save dryness of the throat and nose in a few instances. In cases with hæmoptysis, calcium chloride by mouth was simultaneously given. In some cases syrup of hypophosphites was also prescribed. Practically all the patients were relieved by this treatment, as shown by physical examination of the chest and the disappearance of cough. No recurrence took place. Generally improvement followed the initial iodine injection. Sputum examinations after the fifth injection showed marked reduction in the number of spirochætes. After the second series of injections they had practically disappeared, and little expectoration remained. The iodine treatment was applied also in two cases of bronchial moniliasis, with encouraging results.

The Combined Quinine and Methylene-blue Treatment of Malaria (R. Reitler, *Wien. klin. Woch.*, January 10, 1920).—The author emphasizes the value of methylene-blue as advocated by Ehrlich and Guttmann in the treatment of malaria. Reitler was induced to use it in a number of cases owing to its action in a case of quartan fever which was refractory to quinine. He found that though it was of little or no value by itself in the treatment of malaria, when given with, or shortly after, quinine it prevented any further attacks in cases supposed to be refractory to quinine. It also enabled the quinine to be considerably reduced below the ordinary therapeutical dose, a point of great importance in the treatment of patients who had an intolerance for the drug.

Oxyuris Appendicitis (A. Läwen and A. Reinhardt, *Münch. med. Woch.*, December 12, 1919).—The authors examined 620 appendices, surgically removed, and found oxyurides present in 60, or 9·76 per cent. The clinical picture was that of acute or chronic appendicitis. Severe attacks were rare. The writers accept the general opinion, which is that the worms penetrate the mucous membrane and so open up the way for a bacterial infection. They consider it probable also that the parasites cause by their toxins a superficial transient inflammation of the mucous membrane with symptoms of appendicitis. A certain diagnosis cannot be made, but relatively slight objective findings with fairly acute or chronic symptoms may indicate oxyuris appendicitis. The diagnosis is rendered the more probable if oxyurides have already been found in the stools several years previously.

Rat-bite Fever: Report of a Case (Aaron Arkin, *Archives of Internal Medicine*, January, 1920, vol. xxv, No. 1).—The author, after giving a full, historical and general clinical account of the disease, describes a case he has observed in an American boy. The patient was bitten on the right index finger by a large grey rat. When the boy reached home the finger was painted with tincture of iodine. The wound healed nicely, but on the fourteenth day he began to complain of pain and of a burning sensation in the finger. The supratrochlear glands and the glands in the right axilla became enlarged. Three days later symptoms of drowsiness, general weakness, headache, diarrhœa and vomiting appeared, and the temperature rose to 102° F. The temperature became normal after a few days, but a little later two other attacks of fever developed. The blood examination showed: Erythrocytes, 4,100,000; leucocytes, 16,000; polymorphonuclears, 80 per cent.; mononuclears, 16 per cent.; eosinophiles, 4 per cent.; hæmoglobin (Sahli), 75 per cent. No spirochætes were found. Two guinea-pigs were inoculated with blood derived from the patient, but remained healthy. Although spirochætes were not found, the case was clinically a typical one of ratbite fever. All the symptoms disappeared under arsphenamin treatment.

Current Literature.

The Indian Journal of Medical Research. March, 1919.

On the results of a Mosquito Survey of Indore City (M. O. Tirunardyana Iyengar).—The species of mosquitoes found in Indore City were (1) *Anopheles rossi* (Giles), (2) *A. culicifacies* (Giles), (3) *A. stephensi* (Liston), and (4) *A. barbirostris* (Van

der Wielp) besides several species of culicines, some of which breed in fresh and some in foul water. Methods for their control are suggested.

Hydrocyanic Acid Gas as an Insecticide (W. Glen Liston and S. N. Gove).—The authors found that 30 parts of HCN per 100,000 parts of air within a room kills bugs and lice in all stages of development, including the eggs, with an exposure of two hours. 110 parts of HCN per 100,000 parts can be obtained in a 100 cubic feet of space by mixing $\frac{1}{2}$ oz. potassium cyanide with $\frac{1}{2}$ oz. of sulphuric acid, each made into watery solutions of 33·3 per cent. A detailed paper is promised.

Beriberi (P. Hehir).—The author has had an extensive experience of beriberi during the last ten or twelve years in Assam, Burma, the Philippines, Japan and also had charge of a series of outbreaks among British troops in Mesopotamia in 1915-1916. Wherever encountered the disease was always clinically identical, falling into the accepted classical types. He considers that the theory that beriberi is a deficiency disease due to the absence of a special vitamine in the diet appears to explain the conditions of the Mesopotamian outbreak more rationally than any other theory. He therefore accepts this theory in the absence of any more convincing view.

Report on the Anti-beriberi Vitamine Content and Anti-scorbutic Property of Sun-dried Vegetables (J. A. Shorten and Charubrata Roy).—From experiments on fowls and guinea-pigs Shorten and Roy found that sun-dried carrots, spinach, cabbage and onions all retain in full their anti-beriberi vitamines and that sun-dried cabbage, carrots and onions retain their anti-scorbutic properties to some extent, whilst sun-dried spinach seemed to have no protecting power whatever against the onset of scorbutic symptoms.

Scurvy (P. Hehir).—During the seige of Kut scurvy caused about 1,050 admissions—all but one in Indian troops and followers. The disease arose principally from an absence of fresh vegetable food. It was found that as soon as wild herbs and shrubs, including grass, sprang up at the end of February in sufficient quantity to be collected, cooked and eaten, the disease incidence declined although the men were on semi-starvation rations. It would appear that the anti-scorbutic principle is contained in all harmless green stuffs and herbs.

Meteorological Conditions in Mesopotamia affecting the occurrence of Heatstroke (J. Taylor).—It was found in Mesopotamia that when high temperatures of 110° F. are reached, a wet-bulb reading of 85° F. is a warning to look out for heat-stroke, and that a further rise of these figures is sure to produce cases, the individuals most likely to suffer being those who already have febrile conditions.

Diagnosis on a large scale in Hookworm Infections (Clayton Lane).—By adopting the levitation method of examining stools in laboratories placed where it is most convenient for communications four thousand-stool units under two commissioned officers would have a capacity of a million positive stool examinations annually. Each thousand-stool unit would comprise one commissioned officer, one assistant surgeon, three sub-assistant surgeons, fifty-six compounders, thirty-four sweepers, one clerk and five chapraissis.

Is Human Bilharziosis likely to spread in India (M. B. Soparkar)?—Although bilharziosis is common in animals in India there is no evidence to show that men become infected in that country except very rarely. Many soldiers infected with the two common types of this worm in Egypt have returned to India during recent years. Whether they will spread the disease to others depends on the existence of suitable intermediary hosts. No species of Bullinus has been found in India, though the nearly allied genus Physa has been found on the Coromandel coast. A number of species of Planorbis are widely distributed throughout the country and these may possibly serve as the intermediate host of *Schistosoma mansoni*.

Enteric Carriers (J. H. Cruickshank and H. M. Lapenais).—Of 1,886 convalescent British soldiers admitted to the Enteric Depot at Parel, forty-nine carriers (2·6 per cent.) were detected by stool examinations. Of these thirty-nine were carriers of *B. paratyphosus* A, nine of *B. typhosus*, and six of *B. paratyphosus* B. The treatment of chronic carriers was found very unsatisfactory. The authors consider that the dangers which carriers constitute are often exaggerated, patients being often subjected to unnecessary segregation. Given good general sanitary conditions, the most important of which is a water-carriage system of sewage disposal, and provided that the carrier has nothing to do with the cooking or distribution of food, there is little danger in his mixing with the general population.

The Amœbic Dysentery Carrier (W. MacAdam).—Attention should be concentrated on the thorough early treatment of primary acute attacks by the combined hypodermic and oral administration of emetine, and of cystic carriers when the signs and symptoms of ulceration of the colon are so slight as to be relatively negligible.

The Rat Problem in India (J. L. G. Kimhardt).—Advocates improvements in the methods of rat destruction.

Rat and Plague Conditions in Hutted Camps (J. Taylor).—The distribution of rats and the incidence of plague were found to be directly associated with the standard of camp management. The camps in which the largest number of cases occurred were

those which did not receive the necessary degree of attention.

Existence of Distoma Disease in India (N. F. Surveyor).—Records a case of fluke disease (probably of the paragonimus species) in a Chinaman in India.

Prophylaxis of Dracontiasis (D. A. Turkhud).—Since such methods of prevention of dracontiasis as filtration, steam sterilization and chemical disinfection are uncertain or otherwise inapplicable the only certain method of obtaining permanent freedom from the disease is to cover every well which supplies drinking water and to lift water from it by means of a suitable pump.

Note on a small outbreak of Lobar Pneumonia in Baghdad due to a Bacillus of the Gaertner Paratyphoid Group (W. MacAdam).—Blood culture from cases of lobar pneumonia with two deaths in cases not clinically suggestive of an "enterica" infection yielded organisms with the characters of *B. paratyphosus* B. To differentiate this organism from *B. suipestifer* the author is awaiting the arrival of a suipestifer serum from England to carry out Castellani's absorption test.

Sodium Morrhuate in the Treatment of Tuberculosis (Sir Leonard Rogers and others).—Sodium morrhuate, which is the sodium salt of the volatile fatty acids found in cod liver oil, is recommended by Sir Leonard Rogers in the treatment of tuberculosis on account of its lytic action on acid-fast bacteria. Encouraging clinical results are reported by several observers.

Reviews.

Marine Hygiene and Sanitation. A Manual for Ships' Surgeons and Port Health Officers. By Gilbert E. Brooke, M.A., L.R.C.P., D.P.H. With 4 Plates and 27 figures in the text. Pp. x + 409. London: Baillière, Tindall and Cox. 15s. net.

Although Public Health problems have the same object in view both afloat and ashore marine hygiene has become a highly specialized subject possessed of a literature quite inadequate to its importance. Hence we welcome Dr. Brooke's "Marine Hygiene and Sanitation," which he modestly claims has no pretence to rank as a text book, but simply aims at providing a handy manual of "Sailing Directions" in as practical and colloquial a setting as possible. Be that as it may, it is a book which no ship's surgeon or port health officer can afford to do without. He will find in its pages not only much useful information, but also much good advice often humorously given. The importance of tropical medicine in marine work is readily gathered from a glance through these pages, especially as regards that great tropical triad: plague, cholera and yellow fever.

An Atlas of the Primary and Cutaneous Lesions of Acquired Syphilis in the Male. By C. F. White, M.B., and W. H. Brown, M.D. 1920. London: Bale's Medical Books and Journals. Price 27s. 6d. net.

This unique work is the outcome of the photographic record of 19,000 cases of syphilis seen in an Army Venereal Disease Hospital. In addition to four beautifully executed plates, there are seventy-nine photographs, mostly stereoscopic, for use with a hand stereoscope, which can be supplied. The commentary which is concise and to the point is explanatory of, and supplementary to, the photographs, so that this Atlas makes no pretence at being a treatise on syphilis. In addition to the primary sores, both genital and extra-genital, and the secondary and tertiary cutaneous lesions, a section dealing with non-syphilitic or soft sores is added together with one on some common skin diseases not infrequently mistaken for syphilis. The Atlas should accordingly be of very considerable service to practitioners in any part of the world as an aid to that early and accurate diagnosis of syphilis which is of paramount importance and upon which adequate early and systematic treatment depends.

Personal Hygiene. By M. R. Samey, M.D. Pp. vii + 96. Calcutta and London: Butterworth and Co. 3 rupees net.

Manuals of personal hygiene are only too rare, especially those dealing with India in conformity with the social, economic and religious customs of that populous empire. Hence we welcome this little work of Dr. Samey, whose efforts have nothing to fear from "the rude gaze of the carping critic" which he appears so much to dread. Signing himself "Sentinel of Hygiene and Servant of India," he lays "the lame lahours of this limping Lilliput" as a devout offering at the feet of his patron Deity, Hygiea, who can warmly reply to him "'Well done thou good and faithful servant" and unto other of her devotees "Go thou and do likewise." We look forward to the forthcoming companion volume on "Public Health and Hygiene" promised hy Dr. Samey.

A Primer of Tropical Hygiene. By Col. R. J. Blackham, C.B. Sixth edition, revised and enlarged. Pp. 154. 1919. Bomhay: Claridge and Co. 1 rupee.

In addition to reaching a sixth English edition Col. Blackham's brochure has heen translated into various Indian vernaculars and is accordingly well known in India. It is equally adapted to other tropical regions and also deserves to he equally well known in those regions outside the Indian Empire. Containing accurate and concise information on tropical hygiene in non-technical language we warmly endorse Sir James Cantlie's recommendation that it should form part of the outfit of every person taking up an official or commercial appointment in a warm climate.

Original Communications.

MILROY LECTURES ON THE HIGHER FUNGI IN RELATION TO HUMAN PATHOLOGY.[1]

By Aldo Castellani, C.M.G., M.D., M.R.C.P.

Physician to the Tropical Hospital (Ministry of Pensions), Lecturer at the London School of Tropical Medicine.

Lecture III.

Mr. President, Censors and Fellows of the College,—In to-day's lecture I propose to treat very briefly the subject of fungi in relation to certain skin diseases.

The rôle played by fungi in these diseases is of extreme importance; it suffices to bear in mind the various trichophytoses, the blastomycoses, the sporotrichoses, the mycetomas. It is interesting to note, however, that though, of course, during recent years the all-important rôle played by the higher fungi in dermatology has been amply recognized, not many decades ago most authorities denied them any importance, some considering such organisms to be merely saprophytes, and others going so far as to state that the so-called fungi found in the epidermis and the hairs did not exist, these structures merely representing a granular degeneration of the epidermial cells.

These affections may be separated to a certain extent into two groups:—

(1) The *trichomycoses*.

(2) The *dermatomycoses sensu stricto*.

Of the first group I shall say a few words on the following:—

(1) Aspergillomycosis of the beard.

(2) Trichomycosis axillaris, flava, rubra, et nigra.

As regards the second group I propose touching briefly on the following:—

(1) Tinea flava.

(2) Tinea nigra.

(3) Cryptococcosis epidermica.

(4) Accladiosis.

(5) Blastomycosis.

(6) Dhobie itch (tinea cruris).

(7) Tinea imbricata.

Aspergillomycosis of the Beard.

Aspergillomycosis of the beard and moustache appears under the form of minute dark-greyish nodules, one or several on each individual hair. The first case I saw in Equatorial Africa in 1902 in an Indian merchant; later Chalmers and myself observed several such cases in Ceylon. The fungi found are generally of the aspergillar type, but occasionally organisms of the genus *Penicillium* may be seen. The simplest treatment consists, of course, in shaving, but if the patient does not wish to shave, turpentine will be found useful.

[1] Delivered before the Royal College of Physicians of London,

Trichomycosis Axillaris, Flava, Nigra, et Rubra.

This condition has been known under the term *Leptothrix* for many years, but the various types of it were not differentiated and the ætiology was not

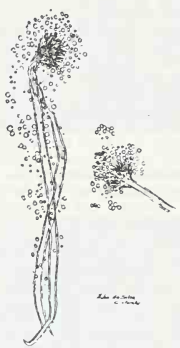


Fig. 1.—Organisms found in a case of aspergillomycosis of the beard.

completely cleared until recently. In the large literature on the subject, the affection is ascribed to the most diverse germs: Eisner describes a diplococcus; Payne, Patterson Pick various bacilli, among which is *B. prodigiosus*.

The condition is characterized by the presence on the hairs of the axillary region (occasionally of the pubes also) of small nodular formations. These nodules may be, in my experience, yellow, or black, or red. I have therefore differentiated three varieties of the affection: Trichomycosis axillaris flava, T. axillaris nigra, T. axillaris rubra.

Fig. 2.—Trichomycosis axillaris flavia.

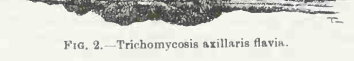


Fig. 3.—Trichomycosis axillaris nigra.

At times one axilla may show the variety nigra, and the other the variety rubra or flava; occasionally the same axilla and even the same individual hair may present two varieties at the same time. In Ceylon and Southern India the three kinds, yellow, black and red, are common; in North Africa mostly

the yellow kind is seen, and at times the red; the black variety seems to be absent in Europe.

What is the ætiology of trichomycosis axillaris? In the researches I carried out in Ceylon in 1911 on the subject, I came to the following conclusions:—

The yellow variety, tinea flava, is caused by a fungus of the genus *Nocardia* (*Streptothrix*), which I called *Nocardia tenuis*.

The black variety is caused by the same nocardia plus a black pigment-producing coccus, which lives in symbiosis with the nocardia. This coccus I succeeded in growing; the colonies after a time become jet black. I called it *Micrococcus nigrescens*.

The red variety is caused by the same nocardia (*N. tenuis*) plus a red pigment-producing coccus, which I cultivated on various media; the coccus gives rise to red colonies and has been further investigated by Chalmers and O'Connell, who have paid me the compliment of giving it my name.

Trichomycosis axillaris is an affection of little or no importance, but I have known European ladies in the tropics greatly distressed by it, as when wearing a low-necked dress the disfiguring red or black patches in the axillary regions are quite visible. It is a curious fact also that natives when affected with trichomycosis seem to regard it with disgust, and readily seek treatment, and Chalmers and O'Connell have recently brought forward the suggestion that the general custom of shaving the axillary hair among certain native tribes may have originated in their profound dislike to this complaint.

The treatment which I found most successful in Ceylon, apart, of course, from shaving, was dabbing the hair two or three times daily with a 1 per cent. alcoholic solution of formalin, with the application of sulphur ointment at night.

Tinea Flava.

Ninety per cent. of the natives of the low country in Ceylon are more or less affected with this mycosis. It generally starts at a very early age, it slowly spreads and seldom, if ever, disappears completely. Variously shaped, bright yellow spots are seen most commonly on the neck and chest, but any part of the body may be affected. In Singhalese poetical literature, reference is often made to the tiny canary-coloured beauty-spots present on the face of Ceylon young women. These spots so much admired by native poets, who have coined a special poetical expression for them, "gomera," are in reality merely minute patches of tinea flava, and are produced by the fungus described under the name of *Malassezia tropica*. Sometimes all the patches of tinea flava coalesce together, giving rise to the diffuse form of the disease. Occasionally one is surprised to see a Singhalese or Tamil native with the face, chest, and trunk of much lighter colour than other natives; on closer examination it will often be found that this apparent lighter colour of the skin is merely due to a diffuse form of a very light variety of tinea flava. Tinea flava was considered to be, until recent years, identical with pityriasis versicolor of temperate climates. I separated from it for the following reasons:—

(1) Tinea flava affects the face more frequently than any other region of the body.

(2) It is extremely chronic, developing in early childhood and lasting for life.

(3) It is most difficult to cure.

(4) The fungus, which I called *Malassezia tropica*, seems to have almost a permanent disturbing action on the pigmentation processes of the skin, as even when the fungus has been destroyed the patches remain discoloured for a very long time, months and years, though they may in the end become again normally pigmented.

The treatment, as I have already stated, is most difficult; turpentine is useful, and on covered parts of the body a chrysophanic ointment may be used.

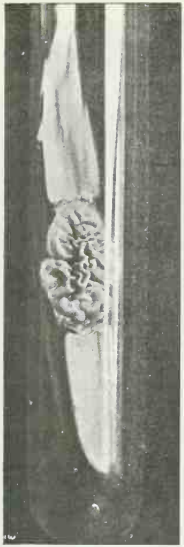
Tinea Nigra.

This tropical dermatomycosis, fairly common in natives, is characterized by the presence of jet-black patches due to a fungus of the genus *Chladosporium*, which I called *C. Mansoni*, in honour of Sir Patrick Manson. This fungus grows on glucose and maltose media, giving rise to black colonies. It may attack Europeans, as shown by the following case.

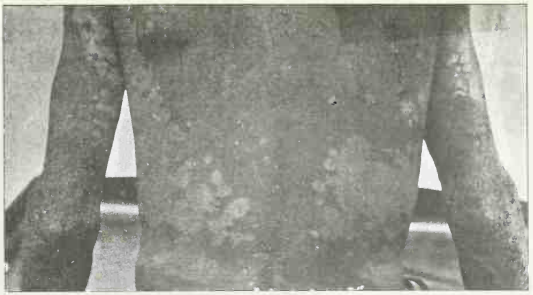
A European medical man went to Burma for a pleasure trip. On coming back to Ceylon he noticed a roundish, very slightly elevated, black spot on the palm of his left hand. This spot slowly increased in size for two months, becoming the size of a sixpenny-piece. A single application of formalin made it disappear, but three months later it reappeared. A second application of formalin cured the condition permanently. From the patch, before treatment cultures were made and a chladosporium isolated identical to that found in native cases.

Cryptococcosis Epidermica.

Some years ago I noticed on the skin of one of my bungalow servants several brownish dirty-looking patches, which looked very much like dirt. He told me, however, that they did not disappear on using soap. I made a scraping and saw that these patches consisted of a large number of budding cells which I believed to be saccharomyces. I found the same patches, not only in other natives, but also in Europeans, especially on the chest and arms, and called the condition saccharomycosis epidermica, which term I changed later into the more correct designation cryptococcosis epidermica. I did not succeed in growing the fungus. Recently Chalmers and others have confirmed my findings in the Sudan and North Africa, but the organism has not yet been cultivated. As to treatment, ordinary soap will not remove the patches; sand soap occasionally does. In obstinate cases the patches may be touched with an alcoholic solution of salicylic acid and then a salicylic-sulphur ointment may be applied.

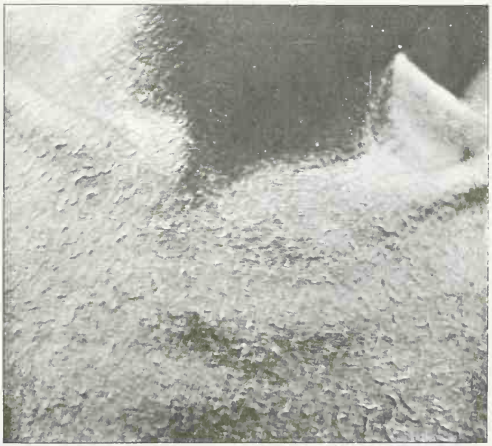


Endodermophyton tropicale Cast.

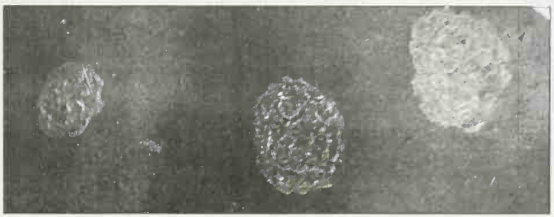


Tinea flava.

Tinea imbricata.



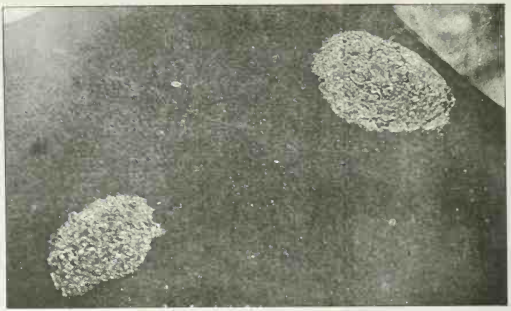
Tinea imbricata.



Experimental tinea imbricata obtained by inoculating a culture of *Endodermophyton indicum*.

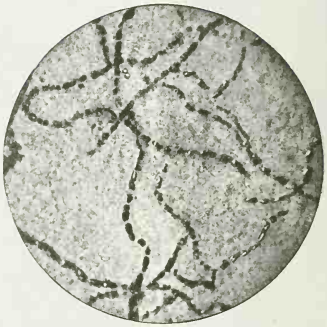
To illustrate paper, "Millroy Lectures on the Higher Fungi in Relation to Human Pathology," by ALDO CASTELLANI.

Dhobie itch (Tinea cruris).

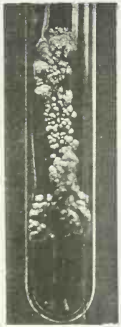


Experimental tinea imbricata, obtained by inoculating a culture of *Endodermophyton tropicale* Cast.

Blastomycosis simulating a syphilide.



Endodermophyton tropicale in the scales.



Acclacium castellanii Pinoy, culture on glucose agar.

Acclacium castellanii Pinoy, culture on carrot.

Acclacium castellanii Pinoy, culture on potato (old).

To illustrate paper, "Milroy Lectures on the Higher Fungi in Relation to Human Pathology," by ALDO CASTELLANI, C.M.G., M.D., M.R.C.P.Lond.

Accladiosis.

This dermatomycosis, described by me some years ago, is caused by a fungus of the genus *Accladium*. I grew the fungus from the lesions and sent cultures to Professor Pinoy, of the Paris Pasteur Institute, who kindly described it botanically, and honoured me by calling it after my name. I quote his description:—

"The growth on artificial media (such as carrot, potato, glucose-agar) consists of many small roundish masses, which later on may coalesce, and are covered by spicubated formations, giving them a

FIG. 4.—Glucose-agar culture of *Accladium castellanii*, Pinoy.

prickly appearance, and consisting of erect, straight filaments, parallel to each other, or at times interlacing. These filaments are approximately 2 microns in diameter, and carry laterally pseudo-

FIG. 5.—A case of accladiosis, showing characteristic roundish or oval ulcers, with sharply defined edges and a granulating fundus.

conidia of variable shape, cylindriform, pyriform, or spherical, attenuated in size at their points of insertion. Most of these pseudoconidia are 4 microns in length, and have a breadth of 3 microns. This type of fructification recalls the type *Accladium*, described by Bodin in certain species of the genus *Trichophyton* (Malmsten, 1848). These pseudoconidia become detached and then develop by sprouting, and mycelial filaments are formed. Certain filaments produce spherical chlamydospores arranged in small strings, as found in certain fungi of the genus *Fusarium*. These small chains of chlamydospores are very frequently terminal, the dimensions being variable—8 to 10 microns."

The affection is observed in Ceylon and the Federated Malay States, and during the war I found a case in Macedonia. Clinically this dermatosis is very characteristic; in a well-marked case ulcerative lesions are present all over the body; the ulcers are roundish or oval, sharply defined, and with a red granulating fungus. There is often a fairly abundant purulent secretion, which dries up in thick bright yellow crusts covering the ulcers. Occasionally gummatous nodules and furuncle-like lesions are seen. The course of the disease is very long, and generally there is very little or no tendency to spontaneous cure. Potassium iodide when given in full doses is generally successful.

Blastomycosis.

The term blastomycosis is generally applied to affections due to fungi of the genera *Saccharomyces*, *Cryptococcus*, *Monilia*, *Oidium* and *Coccidioides*. The clinical appearance may greatly vary; the cases I have seen may be classified into three principal groups:—

(1) The cutaneous type.
(2) The muco-cutaneous type.
(3) The gluteal blastomycosis.

The *cutaneous type*, characterized by verrucose patches with minute abscesses, is quite common in Ceylon and other tropical countries, and occasionally cases are seen also in temperate climates.

Muco-cutaneous type.—In this type the disease attacks not only the skin, but also the mucosæ, principally the oral mucosa and the pharynx, giving rise to numerous small verrucoid papillomatous or framboesiform patches, which later may ulcerate. This type is common in South America, where it has been investigated by Splendore and others, but a very similar type is found also in Ceylon and other tropical and subtropical countries.

Three weeks ago I saw a demobilized officer with lesions on the left angle of the mouth, portions of the oral mucosa and of the tongue, which closely resembled a syphilide. The lesions had made their appearance in Egypt. The patient denied ever having contracted syphilis; moreover, in Egypt his blood was examined for Wassermann three times, always with negative result. Notwithstanding the negative Wassermann the patient had several salvarsan injections and a long course of mercurial treatment without any benefit. In scrapings from the lesions I found a few yeast-like bodies, and culturally I have grown a fungus which resembles more a monilia than a saccharomyces or a cryptococcus. Under an iodide of potassium treatment the lesions are already very much better.

Gluteal Blastomycosis.—This variety has been described by Kartulis in Egypt, and I have seen cases in Ceylon. The gluteal regions present a diffuse induration and are cribrated with numerous openings from which a thin purulent liquid exudes. Fungi of the genus *Saccharomyces* or *Monilia* are generally isolated from the pus.

As regards the prognosis, this is on the whole favourable in the cutaneous type provided an appropriate treatment is carried out—much less favourable in the muco-cutaneous and in the gluteal varieties. It must also be remembered that occasionally the organisms enter the general circulation and give rise to a pyæmia-like fever. Occasionally, in fact, one comes across cases of blastomycetic septicæmia without any skin lesion, and these cases as a rule terminate fatally.

Dhobie Itch.

I know of very few Europeans who, after one or two years residence in the tropics, have not contracted that most distressing and intensely itching condition of the inguino-scrotal region, which is known all over the East as dhobie itch, from the popular belief that it is acquired from underclothing and linen contaminated while being washed by the dhobie (native laundryman).

What is dhobie itch? It is in reality the old eczema marginatum described by Hebra. The history of the disease is briefly the following: About the middle of last century Hebra in Vienna described eczema marginatum of the inguinal regions. Later trichophyton-like fungi were found by various observers, and the condition was considered to be an inguinal localization of tinea corporis, and the fungus was believed to be the same as *Trichophyton tonsurans*.

In Ceylon in 1905 I suggested that the condition should be definitely separated from tinea corporis, having found a fungus very different from those observed in the usual types of tinea corporis; this fungus was characterized by not attacking the hair or hair follicles, and by its colonies on maltose or glucose agar being of a peculiar yellowish colour, lemon-yellowish or orange-yellowish. I called it *Trichophyton cruris*.

In 1907 the same fungus was found by Sabouraud in France and called *Epidermophyton inguinalis*.

I sent the cultures of the Ceylon strain both to Sabouraud and Pinoy, and they concluded that the French strains and the Ceylon strains were identical. According to the laws of nomenclature the correct name is *Epidermophyton cruris* and not *Epidermophyton inguinalis*, as when a fungus is moved from a genus into another it does not lose its specific designation. As is well known, the generic designation of an organism may be changed, but the specific designation cannot be altered.

In 1909 I found that certain cases of dhobie itch were due to a different epidermophyton (*E. rubrum*), and later I observed that a few cases were due to a true trichophyton (*T. nodoformans*). There are, therefore, three species of fungi which may give rise to dhobie itch: *E. cruris*, *E. rubrum*, *T. nodoformans*.

(1) *E. cruris*, as already stated, is characterized by its lemon-yellowish or orange-yellowish colonies.

(2) *E. rubrum*, which I described in 1909, is characterized by the deep red pigmentation on glucose agar.

(3) *Trichophyton nodoformans* is characterized by the fact that the surface growth is white and powdery, while the submerged portion is of a brick-red colour, which, however, disappears after repeated transplantations.

It is interesting to note that each species gives rise to a slightly different type of dhobie itch.

E. cruris causes the common festooned variety identical with eczema marginatum of Hebra.

E. rubrum causes an eczematoid-like variety; the edge is less raised and is made up of numerous small close-set papules covered at times by minute bloody crusts. It has great tendency to spread from the scroto-inguinal region to any part of the body and may, in fact, begin on practically any region.

T. nodoformans induces an eruption with a very thick nodular margin, and the fungus may attack the hair follicles.

One word as to prognosis and treatment. An apparent cure is quite easily achieved, but a true cure is much more difficult. In patients who had dhobie itch in the tropics and have settled in Europe the infection may last for very many years, remaining dormant in winter, but breaking out regularly every summer; the best treatment consists, in my experience, in a salicylic-sulphur ointment, and in very obstinate cases chrysophanic acid may be used.

Tinea Imbricata.

This dermatomycosis, which is extremely common and of great practical importance in certain tropical countries, was first described by Dampier in his

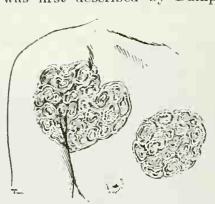


FIG. 6.—Tinea imbricata.

book, "A Voyage Round the World," in 1789. In Alibert's "Atlas of Skin Diseases," published in 1832, there is a very good illustration depicting the disease. In 1874 Tilbury Fox gave a description of the complaint under the term Tokelau Ringworm. He detected in scales a filamentous fungus and considered it to be identical with the fungus of

European ringworm. From that time discussion began and continued for many years on the subject whether the disease was a separate entity or merely European ringworm modified by the different climatic conditions. The great majority of the European authorities, who, however, had no personal experience of the malady, were opposed to considering the disease a separate one, while the medical men practising in the tropics generally believed it to be a different affection from ringworm. Very valuable researches were carried out by McGregor in 1870 and Coniger in 1871, but Manson's researches in China during the period 1879-1882 are by far the most important. He described the eruption in a masterly manner, and first introduced the very appropriate name of Tinea Imbricata. Moreover, he gave a very good microscopical description of the fungus, although, as might be expected, using the technique of that time, he did not succeed in cultivating it. He considered it to be a non-cultivable trichophyton for which Blanchard suggested the name *T. concentricum*. In recent years the malady has been generally considered to be a form of Aspergillosis, especially after the well-known researches of Tribondeau, Wehmer and many other observers. Tribondeau described fructifications somewhat similar to those of an aspergillus and created for the fungus the genus *Lepidophyton*. Wehmer described it as a true aspergillus (*Aspergillus tokelau*). I investigated the malady in Ceylon, and I think I may venture to say that I succeeded in proving that these aspergillus-like fungi have nothing to do with the disease, and that when they are present in the scales, as they often are, are merely saprophytes or contaminations. By using a special technique I succeeded in growing the fungi which I consider to be the true causative agents of the affection. I created for them the genus *Endodermophyton*, of which there are at least four species: (1) *Indicum*. (2) *Tropicale*. (3) *Concentricum*. (4) *Mansoni*. The fungi belonging to the genus *Endodermophyton* by their growing between the superficial and deep layers of the epidermis, form an interlacing felt of mycelium which detaches the horny and granular layers from the rete Malpighi. They do not invade the hair follicles and do not cause suppuration. Their cultures are similar to those of the genus *Achorion* (see Castellani and Chalmers' "Manual of Tropical Medicine," p. 1016). The difficulty in growing artificially such fungi is explained by the fact that they do not grow on solid media direct from the scales. These after being treated with alcohol from five to ten minutes must be placed in glucose broth tubes, one scale in each tube. Most of the tubes become contaminated with bacteria, but in those which remain clear, after a time, five to ten days, a few delicate short mycelial filaments will be seen originating from the scales. The growth slowly increases until after a few weeks it takes the appearance of a small white fluffy mass with a dark spot (the scale) in the centre. The fungi can then be transplanted on solid sugar media, on which they then will grow quite well, and from which they can be sub-cultivated indefinitely. The species may be differentiated as follows:—

(1) Glucose agar cultures—amber coloured. Duvet —absent or present only in very slight amount. —*Tropicale*.

(2) Glucose agar cultures—deep orange or pinkish or red, white. Duvet often present.—*Indicum*.

(3) Glucose agar cultures after some weeks become black.—*Concentricum*.

(4) Black pigmentation very rapid.—*Mansoni*.

By inoculating cultures of the first two species I have succeeded in experimentally reproducing the disease in natives who had volunteered (see plate).

A few words on the predisposing causes. As regards age, in my experience young adults are mostly affected, but children and very old people may contract it. Men are much more frequently infected than women. It is doubtful whether there is any racial disposition. In Fiji it is said, however, that the immigrant Tongas rarely contract the malady, while the indigenous Fijians are extremely prone to it. Some authorities believe that this relative immunity is due to the habit the Tongas have of anointing their skin.

As regards climatological influences, Manson has made the interesting observation that tinea imbricata is rife especially in those tropical countries and districts in which the climatic conditions are favourable for the growth of the coconut tree. I can confirm Manson's observation. In Ceylon tinea imbricata is not very common, but the cases one sees generally come from the coconut districts. There is no doubt that a hot moist equable climate is the most suitable for the fungi of tinea imbricata, as it is the most suitable for the growth of the coconut tree.

Clinical Symptoms.—The development of the eruption is most interesting. At the very beginning one or several small roundish or oval dark brown, very small spots appear, generally on the arms, chest or back. After a short time each brownish spot splits in the centre, and in this way a ring of flaky large scales attached at the periphery is formed; this scaly ring expands peripherally, and while it does so another brownish spot appears in the centre, in the same site as the first brown spot; this new brown patch also breaks in the centre, and in this way a second scaly ring is formed, which expands towards the periphery inside the first ring; again in the centre a dark patch appears, which splints, and a third ring is formed inside the second; and so on until a number of scaly rings develop. Sir Patrick Manson has aptly compared this development of concentric rings to the concentric ripples produced by a pebble thrown into a pool of water, and when the eruption starts from many points, as is often the case, owing to auto-inoculation, it is as if a shower of pebbles had fallen in the pond, and many systems of spreading rings are produced which intersect each other in various ways.

The scales are flaky, tissue paper like, large, up to half an inch in length, dry and of a dirty greyish

or brownish colour. The fungus never invades the hair follicles, nor, according to some authorities, the nails. I must say, however, that in my experience the nails are often affected, becoming discoloured and brittle, and this has been also Manson's experience.

The eruption has not much effect on the general health of the patient, but the pruritus it induces is really terrible, and the native patients refuse to do any work and remain in their compounds, where they can be seen squatting or lying down and scratching their bodies the whole day long. I have noticed that the itching is greatly increased by giving certain diets: for instance, the dry fish diet often given in Ceylon hospitals makes the pruritus absolutely unbearable.

Diagnosis.—The clinical picture of the disease is most characteristic, even when the eruption is of the diffuse type; the large dry tissue paper like scales overlapping each other like tiles on a roof are quite typical, but the diagnosis is certainly very difficult to the newly arrived European medical man, who may never have heard of the disease. On superficial examination the malady does not strike one as being of epiphytic origin, and the cases I generally had in the Colombo Clinic were often diagnosed by visitors—and naturally so—as cases of ichthyosis or of pityriasis rubra, and it is in fact interesting to note that one of the many synonyms of this malady is "tropical ichthyosis." Of course, the microscopical examination of the scales will reveal presence of an enormous number of mycelial filaments, and this will clear the diagnosis at once.

Prognosis.—The disease, as I have already stated, has not at first a serious influence on the health of the patient, but the affection is chronic, and after a time the patient not rarely becomes anæmic, emaciated and a nervous wreck, owing to the continuous sensation of pruritus and loss of sleep. At any rate the patient is not fit for any work, and this is of great practical importance as it tends to decrease the labour force on low country estates.

I may be allowed to say one word with regard to treatment. The disease never shows any tendency to spontaneous cure, and its treatment is most difficult as every tropical practitioner knows. It is easy enough to obtain a temporary improvement and even a disappearance of the eruption; but as a rule a few days after discontinuing the treatment the eruption starts afresh.

In the Colombo Clinic I experimentally tried the most different drugs and ointments and came to the conclusion that the best routine treatment is by resorcin dissolved in tr. benzoin co. (res. ʒi, tr. benz. ad ʒij) or by chrysarobin ointment.

It is interesting to note that resorcin in ointment or in alcoholic solution has practically no action and that tr. benzoin co. alone has also practically no action, but when the resorcin is dissolved in the tincture very good results are obtained.

OBSERVATIONS ON A CASE OF ONYALAI IN THE EAST AFRICAN PROTECTORATE.

By T. B. Welch, M.B.London.
Medical Officer in charge, Kenya Province, E.A.P.

Since Dr. Yale Massey in 1904 and in 1907 published articles in the Journal of Tropical Medicine and Hygiene on "Onyalai, a disease of Central Africa" a number of cases have been recorded having features in common, if not identical, with those that he described. Such cases have been met with in Portuguese West Africa, in the Congo Basin, and in the Tanganyika territory. So far as I am able to ascertain the disease has not hitherto been reported as having occurred in the East Africa Protectorate. Some particulars therefore of a case recently under my care and bearing a close resemblance to the disease as described by Dr. Yale Massey, may be of interest.

The patient, a native aged about 25, came to the Native Hospital, Fort Hall, complaining of bleeding from the mouth.

He gave the following history: Five days before coming to hospital he first noticed that his mouth was sore and was bleeding. The hæmorrhage had become neither worse nor better since shortly after the outset. In all other respects he felt quite well, and had reported sick to his employers, who ordered him to hospital, solely on account of the inconvenience of the condition. On being questioned he stated that on the day preceding, and on the day of his arrival, he had noticed that his urine was of a very dark colour but that micturition was painless and that there was no pain in the abdomen or loins.

The man, who is of good physique, reached the hospital in quite satisfactory general condition although he must have lost a considerable volume of blood and had walked a distance of over thirty-five miles in about a day and a half. When seen he was emitting saliva in large quantities and mixed with blood at very short intervals; the total amount was large; since it was found that he emitted nearly half a pint in twelve hours, and this process according to his statement had now lasted five days and was to last yet another ten before any diminution was noticed.

The following lesions were found, viz., bullæ or ulcers or both in the mouth, nose and skin. There was no evidence of any lesions of the digestive apparatus, with two doubtful exceptions to be referred to later, nor of the respiratory apparatus other than these: The thoracic and abdominal viscera appeared normal except the spleen which was slightly tender, readily palpable, firm, and extended one and a half inches below the costal margin on expiration.

The organs of special sense appeared to be normal except that a slight yellowness of the sclera, such as is often seen among natives apparently in good health, was noted.

Slight pallor of the face and of the buccal and palpebral surfaces were observed; this vanished

during convalescence and appears to have been secondary to the loss of blood.

The condition of the mouth was as follows: The teeth were good; the gums rather pale but otherwise quite natural; there was no pyorrhœa. The tongue was flabby and tremulous, its dorsum was covered with black fur; also the following lesions were present: a small very superficial ulcer about one-quarter of an inch in diameter was situated one inch from the tip of the tongue, blood was oozing freely from the surface; between the ulcer and the tip there was a bulla not more than one-eighth of an inch in diameter and of a blue-purple colour. On the right margin of the tongue and crossing the level of the attachment of the frenum lingua there was a narrow ulcer about one inch in height and a little deeper than that on the dorsum of the tongue, and from the surface of this also blood was oozing.

On the roof of the mouth, lying mainly to the left of the middle line and crossing the junction of the soft and hard palates there was a mass of clot of about three-eighths of an inch in diameter. From the edges of this clot there was a flow of blood and of a brown fluid, presumably altered blood. The clot was readily detachable and markedly friable; when it had been separated, a superficial ulcer which bled freely and which resembled that on the dorsum of the tongue was seen. The clot re-formed in about a day.

The inner surface of the right cheek showed a mass of clot resembling in size and in other respects that upon the palate. None of these lesions showed any surrounding zone of hyperæmia.

In the anterior nares there was a bulla, resembling that on the tongue, situated on the right side of the septum.

The skin showed during the course of the disease about eighteen bullæ; they were all circular in shape and of under one-quarter of an inch in diameter. If the covering skin was removed, or if they broke down, they bled freely. Some, when opened, showed trabeculation much more markedly than did the lesions in the mouth. A few of the bullæ were umbilicated. Most of these bullæ were on the chest and abdomen; a few occurred on the thighs and arms, in which situations the patient also had scabies: but the majority were well away from the scabies-infected areas. There were no bullæ on the face, hands, feet, or posterior aspect of the trunk. There was no pitting on recovery.

The urine was at first mixed uniformly with much blood and this condition lasted from the fifth to the ninth day of the disease; thereafter the blood diminished in amount until on the thirteenth day it could not be recognized macroscopically, and after the fifteenth day I failed to find any evidence of hæmaturia by microscope. Casts were repeatedly sought for, without success, though the uniform mixture of blood and urine suggests renal hæmorrhage. The daily output of urine gradually fell and did not rise when saline diuretics were given, but did so very markedly when the patient was allowed to drink large quantities of fresh lime squash.

The fæces were of a black-brown colour, and this was probably due to swallowed blood. On only two occasions did I find cause to suspect any lesion of the intestinal tract, and these were: the first on the ninth day of his illness, the second when convalescence was far advanced, and the patient was at this time under treatment to secure the expulsion of a tapeworm (*Tænia saginata*); on each occasion he passed one stool containing very little fæcal matter, but much blood-tinged mucus. Unfortunately I saw both these stools too late for microscopic examination to be of any value. During his stay in hospital he required treatment for tapeworm and for round worms; only two of the latter were found.

Fresh lesions of the mouth and skin appeared up to about the eighteenth day of the disease, concurrently with repair of older lesions. Throughout the patient said that he felt very well and his general condition was good. His temperature was usually subnormal, its maximum, and that on admission, 99° F.

Little was done with regard to pathological investigation. Examination of blood films showed no parasites; the following was the result of the only differential leucocyte count done, viz.:—

Polymorphonuclear ...	...	67 per cent.
Large mononuclear	...	4 ,,
Small ,, ...	...	23 ,,
Eosinophile cells ...	...	6 ,,
Basophile ,, ...	...	— ,,

No abnormal white or red cells were found. No total leucocyte count was done.

I am entirely doubtful whether treatment in any way influenced the course of the disease. Calcium chloride was given in moderate doses for two days, and thereafter an ordinary tonic mixture (ferri et quin. cit., &c.). The motions were kept soft by means of liq. paraffin, and he was kept on a milk diet, both with a view to reducing the efforts of the intestinal tract to a minimum, and so to minimizing the strain upon any ulcerated surfaces that might be formed if the same process occurred, which it probably did not, throughout the alimentary apparatus. The use of diuretics and anthelmintics in this case has been indicated.

The patient left hospital in excellent health thirty-four days after the outset of his illness.

This disease appears to be unknown to the natives of Kenya Province and to those of the East Africa Protectorate in general so far as I am able to ascertain. The patient, a particularly intelligent member of the Wa Meru tribe who inhabit the cool foothills to the north-east of Mount Kenya, was very indefinite, stating that he had never heard of any such condition among his people; no other result has followed on my inquiries of Kikuyus, Swahilis, or Kavirondos, i.e., of representatives of tribes hailing from parts of the country differing greatly from one another, not only in position, but

in climate and in conditions of life. It seems to me suggestive that in this respect my experience differs from that of observers of apparently the same or of allied conditions who have been able to ascertain the name by which the natives knew them, and in some instances to state that the diseases were greatly feared.

The patient had been exposed to the possibility of infection outside of this Protectorate, if, as Dr. Wellman has held, this disease is an acute specific infection. He had served for three years of the war in our Intelligence Service both in German and Portuguese territory, and had been in the country of Wa Nyamwezi, among whom an allied condition Kavindo has been described by Mense, while Feldman, also in East Africa, has found a similar disease known as Edjuo. If, however, the disease is an infection foreign to this Protectorate, then it must be one which may long remain in abeyance, for the patient had returned to this country some nine months before he fell ill.

During the three months preceding the outset of his illness the man had worked in the hot and unhealthy country traversed by the upper waters of the Tana River. This is a sparsely inhabited country, and I have had no opportunity to find out whether symptoms such as the patient presented are known among the scanty population.

It is to be regretted that this particular case throws no new light upon the etiology of this obscure disease.

I have to thank the Principal Medical Officer of this Protectorate for his courteous permission to put forward these observations on an unusual and interesting condition.

Nutritional Œdema and "War Dropsy" (Maria B. Maver, M.D., Chicago. The *Journal of the American Medical Association*, vol. lxxiv, No. 14, April 3, 1920, p. 941).—The author comes to the conclusion that the condition seems not to be a typical "deficiency disease" in the sense of being the result of a deficiency in one or more specific unknown constituents (vitamines) in the diet. In a broader sense it is, however, a deficiency disease, and is the result of a protracted existence on a diet deficient in total calories, especially in protein. Undoubtedly a high fluid intake, and possibly a high salt intake, are important accessory features. Hard work and exposure to cold are factors simply in that they increase the caloric deficiency of the food supply. The experimental work agrees with the clinical evidence in establishing that a combination of low calories, low protein and excessive fluid intake will lead to a marked dropsy corresponding to war dropsy in all respects. The importance of specific vitamines seems to be excluded. Undoubtedly dropsy occurring in many conditions associated with other defective food supply or absorption (as in some types of infantile dropsy) or in conditions of protracted anæmia or cachexia is essentially the same as war dropsy. Hence the author recommends the general term "nutritional œdema" for this class of cases.

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THE JOURNAL OF

Tropical Medicine and Hygiene

JUNE 1, 1920.

TYPHUS.

A circular has reached us to the following effect:—

Sir,—Your readers are well aware of the serious increase in typhus in Eastern Europe, but few realize that this terrible scourge in the near future

may be knocking at our own doors. Adequate assistance must be sent to Poland to deal with the endless streams of refugees pouring through her country.

We most earnestly appeal for funds to send to Poland a completely equipped unit, armed with all the latest scientific discoveries and fruits of modern research, to combat this appalling disease. [Signatures are asked for in this appeal.]

It is hardly necessary to add that the need is an urgent one; there are now in Poland itself 250,000 cases of typhus and this number is increasing daily. Thousands of lives can be saved by sending a unit of this description.

This appeal is issued by the Polish Red Cross. Donations should be sent to the Princess Sapieha, 45, Grosvenor Square, London, W.1.

We need scarcely say that the appeal has our hearty sympathy and we agreed to sign the appeal for insertion in the *Lancet*, the *British Medical Journal* and the *Medical Press and Circular*, at the behest of the Polish Red Cross Committee, London. Co-operating with the Polish Committee we find that the Serbian and the Russian Red Cross societies are working in harmony and were represented at the meeting in the London County Hall of the National Committee for the Relief of Distress in Eastern Europe.

Typhus fever is considered for the most part as a disease not of the tropics but of temperate climates. This is true, but it may be stated at once that whenever or wherever in the tropics the climate approaches that of the temperate or even the colder regions of the world typhus prevails, and Castellani and Chalmers did wisely to include a full description of typhus in their recently published third edition of their famous manual. Anywhere in the sub-tropics where a cold season is experienced typhus is met with; for given a high altitude and a cold season in any "tropical" region the disease is wellnigh invariably met with.

The explanation is simple. In these "tropical" regions where cold is experienced at any time of the year shut windows and closed doors obtain, and overcrowding results so as to economize fuel used for the purpose of ensuring warmth. The fewer the fires the greater the economy in a house, with the result that the family sleep in one apartment more or less, and overcrowding—the breeder of typhus—prevails. It may appear in families living in isolated abodes far removed from neighbouring dwellings, be it in the mountainous districts of Afghanistan where the outside air is fresh and clear, or in the isolated "cabins" on the West Coast of Ireland exposed to the fresh sea breezes from the Atlantic. In such abodes in Ireland we know that as many as a dozen persons sleep in one small apartment and severe outbreaks of typhus have occurred in the country even during quite recent years.

How do these people, seeing but little of their neighbours, carry the disease from one worker to another? Does the contagion remain in the human body? Does man remain a carrier as in the case of typhoid, in which we know that some few persons, who have had typhoid, may remain carriers of the typhoid bacillus for the rest of their days and so remain a standing danger to their neighbours, or are the recurrences of the disease explained otherwise? The louse—*Pediculus corporis* de Geer 1778—is now known to be the infecting agent. The overcrowding due to poverty or cold seasons exposes the family to louse bites, and if the louse is infected the chances of infecting mankind are evident. Does the louse remain infected from one season to another? Is the typhus infecting agent transmitted from louse to louse without the necessity of it passing through an alternative host? Is it a case of the young getting infected after birth, or is it transmitted to the young *in utero*? Both theories have their supporters. The only way to prove these surmises as to transmission is to find a dwelling in which typhus has prevailed during the cold (or overcrowded) season, and place another large non-immune family in the same room when next cold season comes round but under completely sanitary conditions and await events. If they do not develop typhus in this sanitary room in which no lice can live then may we assume (but of course not wholly prove) that it is the absence of lice that explains the negative finding. This is one form of investigation; there are many other plans, all of which have been considered and gone into fully by several observers, amongst whom Dr. Wm. Hunter, C.B., and Dr. A. Castellani, C.M.G., have, whilst in Serbia, gone fully into and given us a basis for our knowledge of how an epidemic of typhus is to be handled scientifically.

It seems that it is not the fact that poverty prevails, with poor clothing and insufficient food, that brings about typhus, but the presence of vermin, and the louse in particular, for other carriers besides the louse are accused of spreading the disease. The bed-bug ranks high in this category, and yet others—blood-sucking insects, &c., have been accused. The tick and even the flea have been pilloried also, but the *Pediculus corporis* is considered *the* aggressor and transmitter. All recent beliefs centre around this pest; it may be, however, too acutely. In 1912 Anderson and Goldberger showed that *Pediculus humanus* Linnæus 1775 and *Pediculus corporis* de Geer 1778 could both become infected and that these by their bites and when the insects were crushed were capable of transmitting typhus to man. Patton found on the Northwest frontier of India *Clinocoris lectularius* Linnæus, and Husband and MacWalters drew attention to the fact that the distribution of this bug coincides with the distribution of typhus without attempting to determine the part it plays. The class of insects looked upon as "bed vermin" are no doubt the infective agents in typhus and in other ailments; this explains the intuitive dread that women more especially have of vermin about their beds. The dread has been for all time so great with all people,

ancient, mediæval and modern, that it seems proof that these bed vermin were tacitly regarded as carriers of disease and hated accordingly. This time-honoured belief has been worked out scientifically at the present day and a confirmation of ancient and rather mythical belief established.

It seems then war has to be waged against bed vermin and especially against the louse. Overcrowding by itself will not cause typhus where no vermin are present, so that the work of any expedition sent from this country to Poland or elsewhere will have to be equipped with (1) measures to cleanse the home of vermin, and (2), most important, the means of protecting the persons engaged in this cleansing against being themselves infected; a process difficult in the extreme.

No better scheme for this combined effort of sanitary work is to be found than that published in Castellani and Chalmers' third edition, page 1338, under the heading of Prophylaxis, and we quote from that as follows:—

Prophylaxis.

This is summarized in one word, "lousing," in which we include the destruction of lice on the person and on the clothes.

The procedure is sufficiently simple: the person goes into a room, takes off the clothes, which are steamed or boiled, passes into another room, and is sprayed with kerosene oil or petrol, passes into a third room, and receives clean or sterilized clothes.

The sterilization of the clothes may be conducted by boiling, but better still by making them into lightly packed bundles and placing them into a truck or room into which steam is blown. This is easiest done in a truck, the steam being brought from the engine.

A campaign against lice may be conducted on the following lines:—

(A) *Methods applied to Man.*

(I) Give illustrated lectures, so that people may understand about the louse, its habits, its association with disease, and its prevention.

(II) Advocate the use of soap and water and of the frequent bath, as well as of clean linen frequently changed.

(B) *Methods applied to the Louse.*

(I) *Pediculicides*:—

(*a*) *Dry Heat.*—Lice and nits can be killed by exposing them for fifteen minutes at 60° to 65° C.

(*b*) *Moist Heat.*—Lice and nits are killed instantaneously by moist heat at or over 80° C.

This is the method most used for clothing which may be boiled or exposed to steam, but must not be in tightly rolled bundles.

(C) *Chemicals.*

For Use on the Person.—Kerosene oil or petrol spray or vaseline, or cresol soap.

For use on Stored Clothing.—Naphthalene.

(II) *Lice Repellents*:—

Better-class patients.—Dusting powder of menthol 3-5 grains, zinc oxide 1 ounce.

Poorer-class patients.—Naphthalene as a dusting powder

(III) *Special Points*:—

Head Lice.—Shave the head or cut the hair very short, or wash the hair thoroughly with 1 in 40 carbolic acid lotion, which is left to act for an hour, the head being wrapped up in a towel in the form of a turban. Then wash the head with soap and water and apply a dressing to any raw areas; carbolic vaseline (2 per cent.) or white precipitate ointment may also be used to destroy head lice.

Body Lice.—The following drugs arranged in order of efficiency (according to Castellani and Jackson) may be used: (1) Petrol and kerosene oil. (2) Plain vaseline. (3) Guaiacol. (4) Anise preparations. (5) Iodoform. (6) Lysol, cyllin, &c. (7) Carbolic acid, 5 per cent. (8) Naphthalene. (9) Camphor.

(IV) *General Insecticides*:—

The experiments of Castellani and Jackson in Serbia have demonstrated that *pyrethrum* is a very feeble pediculicide, while sulphur, boric acid, perchloride of mercury, when used in powder, have no action whatever.

Substances which may be efficient pediculicides may, however, have little or no action upon other insect parasites of man, such as bugs and fleas. For example, iodoform will kill lice in ten to fifteen minutes, but has no action on bugs and little on fleas. Pyrethrum acts more powerfully upon bugs than upon lice. In order to formulate a general insecticide several chemical substances must be combined. As an example of a general insecticide for use against lice, bed bugs, and fleas, the following is given:—

Equal proportions of naphthalene, previously soaked in guaiacol or creosote, pyrethrum, zinc oxide.

The wearing of undergarments made lice-proof by soaking in various disinfectants (crude carbolic acid and soft soap emulsion), as recommended especially by Bacot, is useful. Legroux's "sachets" or small bags containing naphthalene treated with citronella oil may be used.

J. Cantlie.

Annotations.

Poisoning by Castor Oil Seeds (Epitome of Current Medical Literature, *British Medical Journal*, No. 3093, April 10, 1920, p. 58).—M. Gioseffi (*Il Policlinico*, Sez. Prat., January 12, 1920) recalls two cases in twin brothers, aged 10 years, in whom symptoms developed two hours after eating castor oil seeds. The first symptoms were tremors of the hands and a burning sensation in the throat followed by a bitter taste in the mouth and severe colicky pains in the umbilical region, vomiting, diarrhœa, headache, and giddiness. Considerable improvement followed irrigation of the intestine and injection of caffeine, and by the third or fourth day the vomiting and diarrhœa ceased, but the weakness lasted another week. In neither case was there any sign of impaired function of the kidneys or liver.

Sores analogous to Veld Sores and Barcoo Rot appearing among Soldiers working in Blue Clay and in Chalk (D. D. Logan, *Glas. Med. Journ.*, 1919, xcii, p. 261, and 1920, xviii, p. 13).—The skin becomes dry and cracks easily, besides becoming easily damaged by slight knocks. Hands that are washed after prolonged contact with chalk become dry and harsh and remain so for some time. The washing apparently carries away the oil, previously split up with the formation of calcium soap. A staphylococcal infection becomes superimposed. A routine treatment of an application of bipp and staphylococcal vaccine is set out, together with precautionary measures that will be of interest to physicians and administrators in mining areas.

A Study of New Elements in the Treatment of Syphilis (Mario Copelli, *Giorn. Ital. d. Mal. Ven. e della Pelle*, 1919, fasc iii, p. 154. *British Journal of Dermatology and Syphilis*, No. 377, vol. xxxii, No. 3, March, 1920, p. 86).—Organic compounds of arsenic, vanadium, phosphorus and antimony were tried separately and all combined. The pharmacological action on rabbits and human beings was ascertained, and also the therapeutic effects tested in experimental syphilis in rabbits and in cases of syphilis in man. In the present paper only the experimental results on rabbits are reported. Experiments were first done to ascertain the minimum lethal dose to rabbits of each drug separately and of the four drugs combined. Rabbits were also treated with regular small doses daily for a month. No effect followed except a slight rise of temperature after every injection, and on being killed the animals showed no changes in the organs. The anti-parasiticide properties of the preparations were tested *in vitro*, and these drugs, even in concentrations of 1 in 50, had no effect on spirochætes or the other commoner organisms, and did not inhibit their growth in cultures. The therapeutic effect was tested on rabbits infected on the scrotum with primary syphilis, and it was found that in such an experimental syphilis all the four preparations had a therapeutic action, and in doses considerably under the lethal one had a completely curative action. The preparation of vanadium was found to be the most active; then followed the preparation of antimony, which was slightly less active. The phosphorus and arsenic preparations were found to be the least effective of all. These preparations were all given intravenously, and the author concludes from his experiments that they have an elective parasitropic action on the spirochætes in the lesions. As the preparations had no parasiticide action *in vitro*, he concludes that some chemical change takes place when the drug is absorbed into the tissues. The same results were obtained in rabbits with experimental syphilis when the above drugs were given intramuscularly, but the action of the drugs was not quite so rapid. In the third series of experiments a combination of all the four preparations was given intravenously, and it was found that in doses of 20 cg. (per kilo of animal) the syphilitic lesion rapidly disappeared. The author is of opinion that this combination of drugs is more efficient than either of them singly.

Trench Nephritis.—Bianchi (*Il Morgagni*, December 15, 1919), discussing Trench nephritis at the Medical Congress at Trieste, said all the armies suffered, and the longer the war lasted the more they suffered, which suggests that there was something in the prolonged strain and unusual conditions of war which predisposed soldiers to nephritis. Strictly speaking, trench nephritis is not a new disease, not a special form of nephritis peculiar to war, nor possessing well defined clinical and anatomical characters—it is a nephritis occurring in soldiers at war. The usual type was an acute diffuse glomerulo-nephritis, resembling a post-scarlatinal nephritis. No constant cause could be found and still less any specific germ. Some mild infective condition, perhaps most commonly a streptococcal infection, seemed to be a necessary condition for the development of the disease. Spirochætes were frequently found as concomitant saprophytes. Clinically it was characterized by sudden onset, fever of short duration, early œdema, mostly confined to the face and limbs, dyspnœa and hæmaturia. Albuminuria was constant, but varied in amount. High pulse tension was slight, and an early symptom. The renal function was relatively only slightly affected. The immediate prognosis was almost always favourable and the mortality very low. On the other hand, the ultimate prognosis should be reserved, not only for fear of relapses, or persistent albuminuria, but chiefly lest the acute nephritis should become chronic, which happened in about 19 per cent. of the cases. How far cure is established can only be ascertained with certainty by testing the functional capacity of the kidney by the so-called concentration test,

coupled with the elimination of water. Mere examination of the urine is not sufficient, as this leads to both negative and positive errors. The author also draws attention to the cases of nephritis which characterized the recent pandemic of influenza, of which there were two main types: (1) An acute glomerular nephritis, with scanty albuminuria, hæmaturia, cylinduria and renal desquamation; this type was almost always fatal. (2) Degenerative renal lesions, with much albumin, no hæmaturia, no cylindruria, hyaline casts, of prolonged course.

Ill Effects following Novarsenobillon.—In the *London Hospital Gazette* of December, 1919, Dr. S. Batchelor describes at length, with chart, the case of a Jewess, aged 26 years, in whom urticaria of moderate degree followed a third intravenous injection of novarsenobillon, the fourth injection a week later being followed by general anasarca, a temperature of 105° F., profuse general watery exudation from the skin and a later general desquamation, with a convalescence delayed by pustular infection. There was no albuminuria.

Dr. L. G. Leonard, of Manchester, in the *British Medical Journal* of December 13, 1919, p. 773, describes the case of a private suffering from a macular secondary rash in which the third injection was followed by shivering, backache, and diarrhœa, temperature 105° F., and bile-stained vomiting. There was a profuse watery exudate from the skin. After general desquamation there was a short attack of jaundice.

In the October number of the *Journal of the Royal Naval Service* F. J. F. Barrington describes his experiences on a hospital ship in the administration of 2,000 doses of novarsenobillon. Fever of 100° F. or more followed 107 of the 2,000 injections, these cases being distributed among all stages of the disease. Where the primary sore was unhealed there was fever in 42 to 43 per cent. after the initial injection.

Fourteen cases are picked out, however, as a well-defined group in which fever and rash occurred in the middle of a course of injections. Except for the absence of albuminuria the symptoms suggested serum sickness, due to some body produced by the action of novarsenobillon on the syphilitic virus.

The Action of Various Lower Cryptogams other than Bacteria in the Soil (I.—Wakeman, S. A., *The Importance of Mould Action in the Soil*, in *Soil Science*, vol. vi, No 2, pp. 137-155.—Bibliography of 62 publications. II.—Wakeman, S. A., and Curtis, R. E., *The Occurrence of Actinomycetes in the Soil, ibid.*, vol. vi, No. 4, pp. 309-319—Bibliography of 25 publications. Baltimore, 1918).—I.—*Moulds and Other Lower Cryptogams.* Since the first microbiological investigations into soil up to the last four or five years, the bacteria have been almost exclusively studied to the detriment of the other groups of micro-organisms of which the presence was reported now and again but nothing more. It cannot be denied, however, that the soil contains large numbers of active moulds, actinomycetes, protozoa, rotifera, and, under certain conditions, algæ.

The work of Russell and his collaborators on the influence of protozoa on the fertility of the soil has given rise to a series of other studies on the activity of these micro-organisms. Several workers have also studied soil algæ and several papers have recently been published on the presence and probable action of actinomycetes in the soil.

The author examines the metabolic processes of moulds and other lower cryptogams in the soil with a view to determining their influence on fertility. He reviews sixty-two publications on the subject, compares the biological activity of various lower cryptogams with that of bacteria, and discusses the most important changes of the organic and mineral matter of the soil which are attributable to the action of non-bacterial cryptogams.

Taking his own observations and those of other workers as a basis the author shows that there have been isolated from both cultivated and uncultivated soils a large number of lower, non-bacterial cryptogams, many of which it has been possible to identify. It has been possible to divide this cryptogamic flora according to the conditions under which they live. Mucorineæ and Penicillium predominate in the soil of the cold (northern districts), whereas the soil of the warm (southern) districts contains more especially Aspergillus. Trichodermic algæ are found in large numbers in acid soils. Many soils contain fungi of the genera Fusarium, Cladosporium, Chætonium, Alternaria, &c.

As regards the action of these various cryptogams in the soil, it appears that the development of their mycelium causes modifications in the organic and mineral constituents, but no fixation of nitrogen or nitrification. The decomposition of organic matter by these micro-organisms, however, causes the formation of ammonia, the amount of which depends on the sources of nitrogen and carbohydrates available; these, in decomposing, set free carbon dioxide.

Nitrogenous manures applied to the soil are utilized by these cryptogams to form protein substances at the expense of the plants cultivated which are deprived of part of the substances destined for them. This loss may, however, be largely compensated for by the fact that the soluble nitrogenous matter absorbed by the cryptogams is not absorbed by the sub-soil and when later the cryptogams are subjected to autolysis much of the nitrogen assimilated by them is returned to the soil in a soluble form and may thus be of benefit to the crops.

These cryptogams may also have a beneficial effect on the soil in virtue of their vigorous production of enzymes and acid substances which may modify the constituents of the soil in a manner favourable to the development of cultivated plants,

in particular they may help to dissolve the phosphates and other minerals.

Unfortunately cryptogams capable of living parasitically on certain plants (potato, &c.) may occur in virgin soils in which these plants have never been grown, thus forming a latent danger of contamination.

II.—*Actinomycetes.* These include parasitic and saprophytic forms and are found in the air, water, sewage, milk, and certain wounds, but especially in the soil, where they form a large and important group of micro-organisms (in particular in soils rich in undecomposed organic matter), the activity of which varies with the different species.

After reviewing historically the question of soil-actinomycetes, the author describes their presence and relation to the bacteria in twenty-five soils of North America and the Hawaii Islands. He shows that heavy soils or those rich in undecomposed organic matter generally contain more actinomycetes than light soils, or those poor in such matter.

In the twenty-five soils examined the actinomycetes represented on an average 17 per cent. of the total cryptogamic flora (bacteria and actinomycetes), whereas in an acid soil the proportion of actinomycetes did not exceed 3·5 per cent. Many forms of actinomycetes were isolated from the soils studied, including *Actinomyces chromogenus, A. lipmanii, A. aureus* and *A. rutgersensis.* These were so numerous that they may be considered as species characteristic of the soil.

Current Literature.

INDIAN MEDICAL GAZETTE, Vol. LV, No. 4, April, 1920.

The result of trials of Sodium Hydnocarpate and Sodium Morrhuate in thirteen Indian Leper Asylums (D E. Muir).—The author comes to the conclusion that sodium hydnocarpate and sodium morrhuate represent a distinct advance in the treatment of leprosy. In certain cases all the lesions completely disappeared. He advises a combined use of the two drugs. As it is essential that the treatment should be begun when the malady is in its first stages, he considers that every effort should be made through schools and the Press to educate the public, and inducements should be created to undertake treatment.

Notes on a case of "Hypospadias Perincalis" (Pseudo-hermaphroditus Masculinus Externus) (S. Chelliah).—The author's patient was admitted to the Colombo General Hospital as a female patient. The penis was imperfectly developed, looking not unlike a hypertrophied clitoris, with no meatus urinarius. The scrotum was cleft, looking like labia majora. The right half contained a testis. The other testis was found in the left inguinal canal. The author states that in 910 cases of pseudo-hermaphroditism collected by Neugebauer there were 722 of the masculine variety and only 188 of the feminine variety.

The Treatment of Leprosy (Sir Leonard Rogers).—The author, as stated in previous publications, has proved that the strong power of chaulmoogra oils on acid-fast bacilli is not specific to that group, but is also possessed by cod-liver oil and appears to reside in the unsaturated fatty acids as a class. The sodium salt made from soya bean oil proved to be far less irritating to the subcutaneous tissues and to the veins than the hydnocarpates.

A Report on the Gynocardate and Morrhuate Treatment of Leprosy based on forty cases treated in the Kashmir State Leper Hospital (Ernest F. Neve).—Half the author's cases derived distinct benefit from the gynocardate and morrhuate treatment and the others remained stationary. These remedies should be given with great care in laryngeal and ocular leprosy.

Sodium Morrhuate in Tuberculosis (P. Ganguli).—The use of sodium morrhuate in tuberculosis has given satisfactory results. In some cases in which sodium morrhuate failed to reduce the temperature, sodium hydnocarpate succeeded.

Abstracts.

THE QUESTION OF NATURAL ENEMIES.[1]

By Captain MALCOLM E. MACGREGOR.

Royal Army Medical Corps, Officer in charge, War Office Entomological Laboratory, Sandwich.

IT is far too generally believed that fish and insects predaceous on mosquito larvæ are of immense value. Unquestionably they are of some value, but only under the most unnatural conditions.

If the so-called natural enemies had anything like the power with which they are often credited they would deserve a better name. The balance of Nature is much too stable a thing to be so easily upset. One must remember that in Nature the natural enemies generally exist side by side with mosquitoes, and yet the latter thrive unchecked; and that to introduce fish and other natural enemies is often like bringing coals to Newcastle. The maxim is, "Under unnatural conditions natural enemies may be utilized sometimes with advantage."

Make the natural conditions as unnatural as possible, and one then temporarily upsets the balance of Nature, allowing the enemies a freer action, with a beneficial result sometimes as far as man is concerned.

[1] Abstracted from the *Journal of the Royal Army Medical Corps*, vol. xxxiv, No. 3, March, 1920.

We have around us at Sandwich innumerable anopheline breeding places in the system of dykes that cover so many miles of this part of the country. Here almost all the natural enemies of mosquito larvæ that have ever been cited as such may be found living side by side with the larvæ. Small fish and notonecta (the water-boatman) live in the waters of the dykes in myriads, and yet there is no scarcity of anopheline larvæ in the same water and at all stages of their development.

I have particularly been struck with the often repeated suggestion from people who have heard of the "natural enemy theory" that "millions" might be introduced here advantageously and the mosquitoes thereby controlled. Yet it is easy enough to demonstrate that the fish in the dykes are themselves voracious larvæ eaters in the laboratory, but in spite of this they are still of little use under natural conditions. If in the natural condition of a locality larvivorous fish already exist, it is generally an utter waste of time introducing others.

The whole question of "natural enemies" is mixed up with the less obvious factor, by the factor of prime importance, i.e., simply the rendering of existing conditions unnatural. Here in Sandwich it is upon this achievement only that success or failure turns. Our course is the clearing of the vegetation from the water surface and sides of the dykes, and cutting the sides that sheer edges are formed. Probably in so doing the natural enemies are enabled to attack the larvæ more easily, but this is only a cog in the system of larvæ destruction, and not the whole of the machinery. Natural enemies count for very little indeed in Nature as far as practical politics are concerned, unless conditions are quite unnatural.

Let us consider, therefore, under what conditions natural enemies can with advantage be employed, and as, for all the enemies cited as such, fish are the only enemies that have been proved of any real importance, my remarks are confined to fish.

The cardinal point of advantage is, of course, introducing larvivorous fish into localities where none previously existed, but one must take into account the environment demanded by the fish themselves. It is of no use introducing fish into stagnant pools, for instance, if the pond is too foul for the fish to live in. It is equally useless introducing fish into streams with swampy land on each side of the main current, unless the swampy ground is drained by a system of "herring-bone" or other waterways, up which the fish may ascend, and in order that they may do so the waterways must be kept clear of weeds and vegetation of all sorts.

In Africa during the recent campaign larvivorous fish were introduced from Zanzibar and placed in a lake with swampy surrounding ground, but it was soon found that until the water was well drained by a system of shallow waterways, and these waterways kept clear of vegetation constantly, so that the fish could ascend and descend, there was no marked reduction of the anopheline larvæ. In other words, "no result until conditions had been made quite unnatural."

The most striking application of the use of fish as natural enemies with beneficial results is the introduction of larvivorous fish into water tanks where anophelines are breeding, and where the water cannot be treated with oil or other larvicides, as, for instance, drinking water reservoirs. But this success is due in the main to the fact that the anophelines are living in conditions not provided by Nature and wholly artificial.

One finds this is true for the whole subject of control on insects by natural enemies, and is not merely confined to the control of mosquitoes. It was once thought in America that by the introduction of a certain foreign species of *Coccinellidæ* ("lady-birds") which is predaceous on a woolly aphis which caused great economic loss to fruit farmers in California, a splendid means of extermination of the aphis had been hit upon. By the introduction of the "lady-birds" an unnatural condition had been set up, and all went well for a time, to the great delight of everyone concerned. All might have continued well if it had not rested with Nature to have the first and last say in the matter. Her universal demand that a balance be struck in the operation of her affairs prevailed, and in a short time the introduction of the "lady-birds" for the purpose they were to have achieved failed miserably, and the insects were ultimately, I believe, more of a curse than a blessing.

Natural enemies alone will never be a solution to the control of any animal, and it is time that we recognized that the credit given to them is a credit largely due to the advantage that is sometimes gained by man in his ingenious ability to upset the balance of Nature temporarily.

I have no faith in natural enemies as a means of control. Far greater certainty in anti-mosquito measures is always attained by the employment of purely mechanical and chemical agents with the aim of rendering conditions unsuitable to the larval development.

THE SWARMING OF ANOPHELINE MOSQUITOES.[1]

By Charles S. Banks.

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The swarming of Culicidæ has been reported from all parts of the world where these insects are found. Almost every record of such swarming has to do with members of the sub-family Culicinæ, as far as it is possible to ascertain. W. W. Smith says that in New Zealand "a train passed through a wall of mosquitoes three-quarters of a mile in length, twenty feet high and eighteen inches thick," and that this

[1] Abstracted from the *Philippine Journal of Science*, vol. xx, No. 3, September, 1919.

swarm was composed of *Culex (Uranotænia) argyropus* Walk. J. W. Douglas reports a similar occurrence in London, where for ten days hordes of members of the genus Culex swarmed over the neighbourhood and appeared like smoke when it issues from chimneys. They rose in the air for 10 metres and continually danced up and down in the twilight stillness. Holiday records a like phenomenon in which *Culicada nemorosa* Meig (synonym *Culex detritus*) was the species. F. V. Theobald gives an account of *Culex pipiens L.* on the Downs, near Wye, England, " dancing in little clouds where they were sheltered from the wind." Romolo Gessi Pascha speaks of myriads of mosquitoes, which obscured the air at Meshra-el-Rek.

Accounts similar to these have come from every Arctic explorer; and persons who have returned from Juneau, Nome, and Skagway, as well as other parts of Alaska, and from northern Siberia, including Kamchatka Peninsula, even north of the Arctic Circle, mention the immense swarms of mosquitoes that are to be encountered. It would seem from the reports that many of the swarms there were made up largely of females, which accords with my observations in northern New York in years gone by. The consensus seems to be that the swarms seen in the warmer parts of the earth are largely composed of males.

No mention seems to have been made in accounts dealing with mosquito swarming of Anophelines performing this interesting act. Two years ago this month (in March, 1917), having had occasion to descend Faculty Hill at the college campus, at dusk, I encountered two or three distinct swarms of *Myzomyia rossii* Giles dancing in the air, at a height of about 2·5 metres above the roadway. Rapidly sweeping my hand through the swarm I caught a few specimens for the purpose of identification, as I did not observe at the time that they were Anophelines, not Culicines. A note of the occurrence was made, but no further observations were had and the matter was forgotten until March 4 of this year (1919), when, upon returning home from my laboratory at 6.25 in the evening I encountered four distinct swarms within 60 metres of my house, which stands on a rise of ground at the foot of Faculty Hill. These swarms were hovering at about 1·5 metres above the roadway; their music was quite audible, and they were flying against a wind having a velocity of 12 to 15 kilometres an hour, maintaining themselves without the slightest difficulty at any point desired (as, for instance, directly overhead) and following me as I passed through the swarm.

When my hand swept among them, in order to capture a few, the whole mass darted off to right or left, or up or down the road, with the greatest ease and with a decidedly concerted motion, returning when the disturbance ceased. Listening to the house, I secured a net and returned to find that they were even closer to the ground than before, the base of the swarm being less than a metre from the roadway; but, as the entire swarm was dancing up and down, the individuals frequently rose to a height of 3 to 4 metres in the air.

Further observations, made on the evening of March 6 at the same hour, revealed other interesting and important features of this swarming of Anophelines. Having stationed myself at 6.15 in the evening at the upper end of the road, nearly opposite the Forestry Station, I noticed some half-dozen males of *M. rossii* flying swiftly up and down the road, about 1·5 metres above it. Within five minutes several hundreds had assembled, and within five minutes more there were many thousands, grouped roughly into three distinct clusters about 8 to 10 metres apart, each cluster connected with the other by numerous stragglers. Selecting a favourable spot, which would place the swarms between me and the sky, which was then of a pinkish blue, I waited to see what would occur.

At 6.30 the first female was seen to be caught by a male, and the pair flew slowly and obliquely upward and away from the swarm and was soon lost to sight. At intervals of about fifteen seconds other females were observed and this continued until 6.40; so that approximately fifty females were seen to enter the swarm and to be seized by males, each time the pair flying slowly but directly out of the swarm. Two pairs were seen to separate after about thirty seconds in copulation. At 6.45 the swarms had diminished more than half, and at 6.50 only a few stragglers could be seen against the rapidly darkening sky.

During the whole time of swarming two dragonflies were darting in and out of the swarms, and each quite obviously caught a mosquito every time.

The two remarkable features of these occurrences are that the insects are Anophelines, and that they were swarming during a very stiff breeze on each occasion. Many observers, entomologists as well as non-entomologists, have maintained that high winds were inimical to the welfare of the mosquito, and that the insects will not venture forth when strong winds are blowing. It has been repeatedly stated that when mosquitoes are found at a distance from water, they have been wafted thither by gentle breezes.

I feel very safe in asserting that, from the observations made upon these Anopheline mosquitoes in their action of flying against a stiff wind, we must certainly conclude that they have much greater power of flight than would be inferred from their apparently frail structure. If it be true that this species is so resistant to the wind—or rather, so capable of maintaining itself in safety in a high wind—what may not be expected of the more robust Culicines, such as *Culex fatigans* Wied. *Mansonia uniformis* Theob., *Stegomyia scutellaris* Walk., and one or two other species the occurrence of which in a given locality can only be explained by the fact that they must have " come upon the wind."

Many difficulties lie in the way of ascertaining precisely the minimum or even optimum, distances which mosquitoes will fly; but it is certain that at least in the Philippines we must revise our ideas

with respect to their being such frail creatures, not daring to venture forth except in a summer zephyr; and it is hoped that further observations along this line will enable us to say with greater certainty how far a mosquito can or will fly.

PAPULO-URTICARIAL RASHES CAUSED BY THE HAIRLETS OF CATERPILLARS OF THE MOTH (*EUPROCTIS EDWARDSI* NEWM.).[1]

By J. Burton Cleland, M.D.

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At the end of March, 1916, reports were received of the occurrence of irritating rashes amongst a number of people residing in Lindfield, on the North Shore line near Sydney. The rashes occurred amongst members of several families and followed the handling of dead wood, as, for example, getting wood ready for the copper or even in the case of a boy from sitting on a log at the Killara Golf Links. Touching old fencing also was said to give rise to them.

A special visit was made and inquiries conducted. At one house one of the inmates was a girl, aged about 20, who was said to be liable to the rash. At my request she went to the back of the wood-house and handled some fire wood. Two or three minutes later she developed extensive irritation on the arms and neck. I myself then handled the same wood, but felt no immediate effects; eight hours later, however, there was some irritation and next day there were forty-two small wheals on the right arm and about four on the left.

At the time, the cause of these rashes was not ascertained. Several possibilities suggested themselves, one being that the wood in question might be one of those that set up a dermatitis. A recent experience in my own family seems to indicate, however, the cause of the rashes that occurred in the Lindfield district. On November 16, near Mosman, three of my children, aged 10, 9, and 7, found about half-a-dozen pupating caterpillars in flimsy cocoons under the bark near the base of an apple tree (*Angophora lanceolata*). The dry cast skins of the hairy caterpillars were mixed with the slight webbing forming the cocoons. The children gathered the cocoons into boxes. Within two minutes the two elder children complained of irritation on the neck. Shortly afterwards minute urticarial papules could be seen. The children went home hurriedly and calamine lotion was there applied, which eased the irritation considerably. Next day their necks were covered with hundreds of small papules, still very irritating. One of the children, in addition, had papules on the side of the face, accompanied to a certain extent with œdema and swelling of the adjacent eyelid. In the course of several days the papules gradually disappeared, so that little reaction was visible at the end of a week. A younger child and the two parents who had not handled the caterpillars later in the evening also developed on the limbs and body a number of small papules, often extremely irritating, which continued to appear in crops for several days. These were attributed to fine spicules being carried in the air, lodging on the clothing or exposed parts and being from time to time rubbed in.

Inquiry has elicited that a number of other instances of similar irritating rashes have recently occurred amongst children, more particularly in the North Shore district. Usually the cases have occurred in boys climbing trees for cicadas and we have heard of such a child apparently conveying the cause of the rash to its parents. Presumably these rashes were also due to the same caterpillars. It seems reasonable to assume that the Lindfield cases probably had the same origin.

On examination of the webbing of the flimsy cocoons they showed entangled in the threads very numerous minute spicules. These are sharp-pointed, acuminate, with a central cavity and measure 85 μ to 172 μ long. The cavity, which appears as if filled with air in mounted specimens, varies from 31 μ to 58 μ in length. The base of the hairlet is 4 μ to 5 μ broad and is surrounded by four backward projecting clasping barbules, by which the hairlet is additionally supported. Extending forwards, up to and sometimes opposite to the cavity, but not in front of it, are a few smaller backward-projecting barbules arranged in four decussate rows.

When portion of the webbing containing the hairlets is placed on moistened blue litmus paper between two glass slides and these are rubbed over each other, the litmus paper is clearly, but slightly, turned red, no such change affecting blue litmus paper, on which are placed some fibres of cotton-wool, after moistening with the same water and handling with the same instruments in the same way. This reaction suggests that an acid, perhaps formic acid, is present in small amounts.

Dr. A. Jefferis Turner has kindly identified the moth for us as *Euproctis edwardsi* Newm., Fam. Liparidæ (Lymantridiadæ).

In various parts of the world, Australia included, caterpillars of the family Liparidæ are known to produce these irritating rashes. I am not aware, however, that this particular species has hitherto been incriminated. The site of the cocoons, under the bark of the trees which may be later cut for firewood or other purposes, gives opportunity for injury to human beings under circumstances that may render obscure the cause of the irritation. Our own experience suggests that the hairlets, after aerial dispersion, may remain in clothing for some days and from this position gradually enter the skin.

[1] Abstracted from the *Medical Journal of Australia*, vol. i, 7th year, No. 8, February 21, 1920, p. 169.

Original Communications.

THE DIAGNOSIS AND TREATMENT OF TROPICAL HEPATIC ABSCESS.

By Sir Dyce Duckworth, Bart., M.D., LL.D., F.R.C.P.

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We have here to consider a malady which rarely arises in this country. Our experience of it, therefore, comes from imported cases. We naturally associate this disease with dysentery, and commonly recognize it as arising from an infection by way of the portal vein. Three forms of hepatic abscess are now described:—

(*a*) Suppurative pylephlebitis;

(*b*) Pyæmic abscess (which is generally multiple, the worst form of the disease); and

(*c*) Tropical or amœbic abscess (usually single).

(*a*) Suppurative pylephlebitis may be met with in any part of the world. It arises commonly from diseases of the colon or appendix; but it may have as its origin suppuration of the mesenteric glands, abscess of the gall-bladder, or disease of any pelvic origin. The result is spreading purulent suppuration along the portal veins to the liver. It is commonly a fatal condition, and jaundice may be associated with it.

(*b*) Pyæmic abscesses are closely related to this latter form. They may arise from any purulent focus, middle-ear disease, and acute periostitis, or they may originate in the course of the portal vein, from bacillary dysentery, appendicitis, or from the bile-ducts in connection with gallstones. In this grave condition there is high fever, jaundice, with enlarged and painful liver. Pyæmic abscesses are small and commonly multiple.

In all forms of dysentery we have to make sure whether we have to deal with the bacillary or with the amœbic variety. These are very different in their course, and they need very different treatment.

(*c*) Tropical abscess of the liver.—The leading characteristics of amœbic hepatic abscesses are:—

They are solitary or few in number, may be very large, form rapidly, or occupy months before urgent obvious symptoms arise.

Course often latent and insidious.

A history of dysentery is generally elicited, but not always.

Infrequent in women, unknown in children.

Rare before 20, commoner after 25 years of age.

May occur in temperate and careful living persons.

Have a tendency to hurst.

Jaundice slight.

Spleen not enlarged.

Some constitutions, e.g., strumous subjects, more apt than others to suffer.

Commoner in the East than in the West Indies.

May occur on the Mediterranean littoral.

Tropical liver abscess is practically a sequel of amœbic dysentery, and commonly a single lesion, having its usual site in the right lobe. Successful treatment of the original disease should prevent its occurrence, and modern methods of treatment may now be regarded as promptly cutting short amœbic dysentery.

Entamœba histolytica, which is the cause of amœbic dysentery, may set up an abscess of the liver—commonly a solitary one. The onset is insidious. The classical symptoms are a hectic temperature and night-sweats. Leucocytosis occurs. We note diminished movement of the right half of the diaphragm, pain under the right scapula, dragging sensation on the right side, with a fullness and tenderness in the right hypochondrium, and rigidity of the right rectus muscle. But many of these symptoms may be absent. The liver has no sensory nerves, so a large abscess may form deep in its substance without causing any pain. If the swelling is on the upper surface of the liver, it is under the ribs, and not to be felt. How is the diagnosis to be made in such instances? We find that cases of amœbic dysentery are chronic. Bacillary dysentery is acute and generally febrile, with a rapid course. Toxæmia is a marked feature. Pyrexia is rare in amœbic dysentery, and only when an abscess is forming.

We judge of the likelihood of an abscess in a patient who has had amœbic dysentery, and shows no plain physical signs of it by noting his general condition. If he is toxæmic, losing flesh, with drawn face, sallow complexion, expression listless, and a furred tongue, we may safely assume the presence of abscess.

These symptoms at once justify exploration of the liver by punctures with long trocars and cannulæ. No harm is likely to occur if pus is not found. If the abscess is reached, and is small, the further treatment consists in irrigating the cavity with a solution of hichloride of quinine, 1-5 gr. per oz.

The pus in these cases is peculiar and characteristic. It much resembles anchovy sauce, orange in colour. Recovery is the rule under this surgical treatment. Prevention being better than cure, we may now readily avert the occurrence of amœbic abscess by employing an effectual very old remedy, derived from the radix antidysenterica, ipecacuanha, long known (for nearly four centuries) as a specific for dysentery. This is emetine, the active principle of the root, and it is very deadly to amœbæ. Sir Leonard Rogers, I.M.S., has the credit of discovering its extreme and rapid amœbacide action. It is, in fact, a specific remedy. The best salt is the hydrochloride, and this is to be given in gr. i doses dissolved in 2 c.c. of sterilized water twice a day. This dose is equal to ʒi of the powdered ipecacuanha root, and is given hypodermically. This dosage is often found to destroy all the amœbæ in the body in two or three days. Given

in tablet form by the mouth, gr. i tablets may be given on an empty stomach without exciting severe vomiting. The hypodermic method is preferable. If no benefit is found in three days, we may be sure that we are not dealing with amœbic dysentery at all, for it is of no use in bacillary dysentery. This drug has a powerful effect on the intestinal mucous membranes. Many years ago I made many experiments with emetine, and published them in St. Bartholomew's Hospital Reports. I reported in my second contribution to a study of emetine, p. 112, vol. vii, the experience of my friend and former fellow-student, Mr. William S. Eccles, Senior Surgeon to the Great Indian Peninsula Railway Company in Bombay, who was then (1869) employing emetine very freely, and with marked success, in the treatment of acute dysentery. He prescribed doses of ½ gr. with ¼ gr. of morphia and 2 gr. of sugar in powders every four or six hours. These seldom induced nausea. This practice was therefore long antecedent to that of Professor Rogers of Calcutta, and never received, so far as I am aware, any other publication than the above. Sir Leonard Rogers has the credit of having proved that emetine is a specific amœbacide, and a rapid agent for clearing the body of these pestilent invaders.

Powdered ipecacuanha in large doses was formerly very useful, but was always apt to excite severe vomiting.

In this country we do not often meet with the early stage of hepatic abscess. My connection with several of the Indian Railway Companies has enabled me to follow the course of several such cases.

The results of operation on these has been satisfactory in all but two instances. No harm has ever come from exploration. The only unpleasant sequel I noted was in the case of an officer in the Horse Artillery, who found that the weight of his sword was provocative of pain when riding, probably due to some adhesions around the old discharging orifice.

The diagnosis is assisted by careful comparison of the two sides of the chest and hypochondria. The respiratory movement on the right side is generally impaired, and there may be an area of basic and lateral dullness over the right pulmonary base, with absent or enfeebled breath-sounds. These signs alone in a patient from the tropics, who had no history of any pulmonary ailment, would justify exploration with the trocar with a view to find pus. Sometimes subjects of hepatic abscess arrive in this country in apparent good health, and subsequently suffer from pains, pleurisy, with some cough, and wasting. There may be no obvious indications of any hepatic ailment for some weeks, when a palpable tumour may be detected, or a characteristic area of diffused dullness, with tenderness and slight œdema of the right hypochondrium, becomes noticeable. The spleen is not enlarged. There may be slight jaundice sometimes (hepatic pain is due to distension of its capsule). On inquiry, a history of dysentery may commonly be obtained. There need be small doubt as to the nature of the ailment in such a case. Pain is commonly felt when the patient lies on the left side from the falling of the liver to that side.

There is now no doubt that early and free opening is the best and only sure method of treatment for tropical hepatic abscess.

The practice prevents several dangerous risks, such as rupture into the lung, pericardium, or peritoneal cavity. Sometimes there is a favourable outlet by way of the bowel, but we cannot afford to wait for such exits. The results are generally favourable, and the general health rapidly improves as the abscess cavity heals. Preparations of cinchona, at first with sodium bicarbonate, and subsequently with nitro-hydrochloric acid, are valuable during convalescence. Later chloride of ammonium with nitro-hydrochloric acid is desirable. A sheltered seaside climate should be sought, and warm sea-water baths employed. With renewed general health, there need be no hesitation in permitting these patients to return to their duties in the tropics.

SOME COSMOPOLITAN SUDAN SKIN AFFECTIONS.

I.—Herpes Iris.

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Contents. — *Introductory — Historical — Sudan Cases—Morbid Anatomy—Ætiology—Pathology—Diagnosis — Prognosis — Treatment — References—Illustrations.*

Introductory.—Papers have already been published by one of us on several cosmopolitan skin diseases occurring in the Sudan, e.g., Acnitis, Ichthyosis, Pityriasis Rubra Pilaris, Lichen Scrofulosorum, Atrophodermia Biotriptica, &c., and now we bring a few illustrations to show the characters, in the black skin, of some well-known cosmopolitan skin affections.

We begin our short series of notes with remarks upon cases of *Herpes Iris* kindly sent to us by medical officers of the Egyptian Army. This eruption is not common in the tropics and during two decades of medical life therein we know of only three cases.

Historical.—Although the disease shown in figs. 1-4 is commonly known as "Herpes Iris," it belongs to the "Erythemata," being merely a variety of *Erythema multiforme*.

The term Erythema was used by Hippocrates for any cutaneous redness, but Sauvages, and later

Plenck, restricted its meaning, while Willan gave it a definition which is as follows:—

> "A nearly continuous redness of some portion of the skin attended with constitutional disorder but not contagious."

As the second part of his well-known work "Cutaneous Diseases" was issuing from the press, Willan came across a curious form of Erythema which he called "Iris," and announced the fact on the cover of this second part.

In 1813 Bateman reclassified it, placing it under "Vesiculæ" and calling it *Herpes Iris*, by which it is known at the present time, although we recognize that Bateman took a retrograde step in naming it *Herpes*.

On page 235 of his "Practical Synopsis of Cutaneous Diseases" he gave an excellent account of the disorder, which can be readily understood by comparing it with figs. 1 and 3 of the present note. He writes as follows:—

> "Its first appearance is like an efflorescence, but when it is fully formed not merely the central umbo but the surrounding rings become distinctly vesicular. The patches are at first small and gradually attain their full size, which is nearly that of a sixpence, in the course of a week or nine days, at the end of which time the central part is prominent and distended and the vesicular circles are also turgid with lymph and, after remaining nearly stationary a couple of days, they gradually decline and entirely disappear in about a week more."

In Plate LII of his "Delineations of Cutaneous Diseases" appears the classical and much copied representation of the disease which is comparable with figs. 1 and 3 of our illustrations.

Rayer, the celebrated French dermatologist, in 1835 described an *Erythema Iris* and expressed the opinion that Erythema Iris and Herpes Iris were modifications of the same affection.

Hebra, writing in the sixties of last century, drew a distinction between the *fugitive erythemata* and those of longer duration, which undergo successive metamorphoses and are attended by various symptoms. These latter he called "*Erythema exudativum multiforme*," which is, in many ways, a suitable term as their clinical features are multiform, while they are certainly associated, pathologically, with exudation. He objected to the term *Erythema* being applied to these diseases and in that he was right as they are inflammatory in character. Nevertheless he thought it to be more advisable to retain the old names rather than to coin new terms. Herpes Iris is, therefore, a variety of his Erythema exudativum multiforme which is generally shortened to *Erythema multiforme*.

For long it was believed that these eruptions were only associated with the mildest of constitutional symptoms, but the researches of Osler in 1900 made it clear that there existed, though rarely, a type of case which exhibits severe visceral symptoms, e.g., gastro-intestinal crises, nephritis, hæmorrhages from mucous membranes, endocarditis and pericarditis, or more rarely, pulmonary disease, as had indeed been noted by Hebra to be associated with hæmorrhage into the skin lesions, and at times, death. There are, therefore, two types of the disease: *Erythema multiforme leve* and *Erythema multiforme grave*. Luckily, the severe form is rare in the tropics and we have never heard of such a case therein.

This brief history brings our clinical knowledge of Herpes Iris up to modern times and we may now consider our own cases.

Khartoum Cases.—We have met with two cases in the Sudan, the first is portrayed in fig. 1 when the eruption was mainly confined to the face, while the second is shown in figs. 2-4.

The first case showed many spots on the forehead, face, and neck, while in the second case the eruption developed on one hand, one forearm, and on the lips. These latter were ulcerated when we first saw the patient.

In both cases the eruption came ont suddenly and without obvious cause, and both occurred during very hot weather. In both there was slight rise of temperature and malaise.

The clinical features of the disease can readily be gathered by a study of figs. 1 and 3, which depict rounded spots distinctly raised above the level of the surrounding skin and having their centres occupied by largish vesicles which are separated by a zone of congestion from a peripheral ring of vesicles.

There was little or no local pain in our cases, and but slight constitutional disturbance, and the eruption quickly disappeared when appropriately treated as will be described below.

Morbid Anatomy. — Histological preparations could only be made from one case, and owing to a series of climatic and other misfortunes, were distinctly poor; nevertheless they were sufficient to indicate the essential features of the disease.

The first signs are the dilatation of the vessels of the papillæ followed by a considerable amount of œdema (fig. 8). This is followed by dilatation of the intercellular spaces of the epidermis (fig. 7), which may go on, in certain places, to vesicle formation, the commencement of which is shown a little to the right of the centre of fig. 7.

About this time cellular accumulations may be noted around the vessels in the cutis, even in its deepest parts (fig. 5), while the œdema of the papillæ disappears. This cellular exudate is also to be noted in the papillæ (fig. 9) and to extend into the epidermis (fig. 6) in which the cells of the rete may be seen to be degenerating in places, while the stratum granulosum has disappeared. The elements forming this exudate are largely polymorphonuclear, but mononuclear cells are also to be noted.

Ætiology.—No causal organisms can be found in the cutaneous lesions and the general tendency to-day is to look upon all forms of erythema multiforme as being due to anaphylaxis caused by the absorption of some chemical product from the

intestine (*vide* Chalmers and Martyn), or other passages, or from a diseased organ. As to the adjuvant in this action, this is not clear; though the relative infrequency of the disease in the Tropics might indicate cold, yet this cannot be so because our cases occurred in the very hot weather of the Sudan.

No cases have been fully studied on these lines as yet but the success of treatment by intestinal antiseptic therapy in certain cases offers some support to this theory, which explains the slight febrile and constitutional symptoms accompanying the skin eruption (*vide* Chalmers and Martyn).

Pathology.—It would appear as though the primary seat of the disease was in the papillæ, or in other words, that anaphylaxis took place there, and that all the other pathological phenomena were processes of excreting the poisonous products or neutralizing their effects.

Diagnosis.—The essential features of Herpes Iris are:— (*a*) the central vesicle or bulla; (*b*) the surrounding ring of vesicles; (*c*) the affection of the lips and mouth; (*d*) the formation of several rings of vesicles outside the first; (*e*) the slight constitutional disturbance; (*f*) the tendency to recur if not properly treated.

It can be differentiated from its nearest ally in the erythema multiforme group, viz., erythema iris, by the fact that in the former there is a vesicle surrounded by an erythematous blush. The central vesicle dries up and forms a scab and a ring of secondary vesicles forms outside this scab while the erythematous area embraces the whole.

Prognosis.—This is good in the usual simple form of Herpes Iris as depicted above, because the tendency is for the disease to ameliorate of its own accord, but recurrences are liable to occur without appropriate treatment.

Treatment.—The first aim of the treatment is to find the site from which some chemical absorption is taking place. In our second case the intestinal tract appeared to be the only possible place, and, therefore, the patient was placed in bed on a restricted diet and given purgatives and salicin, with immediate and excellent results.

Khartoum,
November 24, 1919.

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ILLUSTRATIONS.

FIG. 1.—An Egyptian soldier showing the eruption of Herpes Iris on the forehead and face. It was also present on the back of the neck but not elsewhere. Photograph. Reduced.

FIG. 2.—Forearm of another Egyptian soldier with a single spot of Herpes Iris. Photograph. Reduced.

FIG. 3.—Eruption on the finger of the same case as fig. 2. Photograph. Reduced.

FIG. 4.—Eruption on the lips of the same case as fig. 2. Photograph. Reduced.

FIG. 5.—Vessel situate deeply in the cutis showing the cellular exudation. Photomicrograph. × 450 diameters.

FIG. 6.—Cellular exudate in the rete Malpighii, the cells of which are degenerate. Photomicrograph. × 800 diameters.

FIG. 7.—Dilatation of the intercellular spaces of the rete Malpighii and the commencement of a vesicle therein. Photomicrograph. × 800 diameters.

FIG. 8.—Dilatation of the vessels and œdema into the papillæ, Photomicrograph. × 200 diameters.

FIG. 9.—Dense cellular infiltration into a papilla around its vessels. Note also that the cellular exudation is penetrating between the cells of the epidermis. Photomicrograph. × 450 diameters.

Atypical Dysentery Bacilli.—Dumas (*C. R. Soc. Biol.*, December 27, 1919) points out that there is no serum reaction that allows one to differentiate true dysentery bacilli from the atypical strains found during the course of an illness. Several observers have relied on the results of subcutaneous injections of bouillon cultures in doses of 10 to 15 c.cm., and if a local abscess, from which the rabbit dies, is produced they have judged the particular organism to be pathogenic. Dumas thinks that the only way to establish the dysenterigenic rôle of an organism is to produce experimentally the same lesions as are found in the human subject. He makes the cultures in Martin's peptone broth, arranging the alkalinity so that the acidity of the medium after ten days' incubation is neutralized by a certain quantity of soda, and filters through a Chamberland F candle at moderate pressure. The filtrate injected subcutaneously into rabbits failed to produce any pathological condition. He therefore concludes that these atypical dysentery bacilli are avirulent and non-toxic. There is no doubt that such bacilli can be found in dysenteric muco-colitis in association with true dysentery bacilli, but the author says that they appear late, about the fourth day of the illness, and are to be regarded merely as saprophytes of the large intestine. In the course of bacillary dysentery a new intestinal flora appears at the ulcerated parts about the fifth day. It is a flora of secondary infection comparable to that found in open infected wounds, but it plays no part in the etiology of the disease. In his opinion the reason why these atypical bacilli have so often been held to be the cause of dysenteries is because the search for the authentic pathogenic germs (Shiga or Flexner) has been instituted too late in the disease, and they have therefore not been detected in the plates.

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

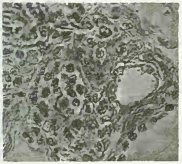

Fig. 5.

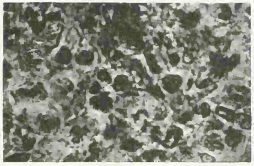

Fig. 6.

Fig. 7.

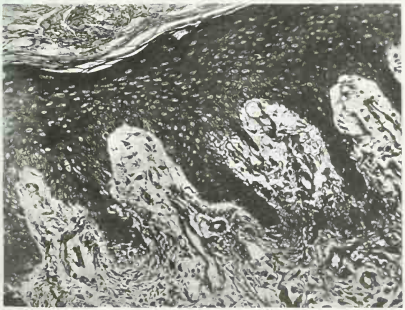

Fig. 8.

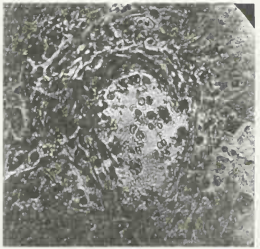

Fig. 9.

To illustrate paper, "Some Cosmopolitan Sudan Skin Affections: I.—Herpes Iris," by Albert J. Chalmers, M.D., F.R.C.S., D.P.H., and Norman Macdonald.

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THE JOURNAL OF

Tropical Medicine and Hygiene

JUNE 15, 1920.

"A MALARIAL BLOOD."

WITHOUT entering into abstruse or debatable points in connection with changes in the blood of malaria patients, let us go no further to start with than the article at page 160 in this issue of the Journal. The article in question is entitled "Some Experiences in the Commoner Tropical Diseases in (late) German New Guinea," abstracted from the *Medical Journal of Australia,* vol. 1—seventh year—No. 5, January 31, 1920, page 97. The writer is Laurence H. Hughes, M.B., Ch.M.Syd., and he gives his beliefs, opinions and observations in a manner indicative of scientific conviction found upon close clinical observation and sound scientific work. The experience was gained in New Guinea, in a district occupied by the Germans until quite lately; a district where malaria reigned in plenty and wholly unchecked. He comments that, apart from typical attacks of malaria met with, the disease presented itself in atypical forms to an extent that excited his interest, and led to careful study of febrile ailments in general that came within his ken. For this reason, Dr. Hughes states, every patient who came under observation, even though he complained of some apparently trivial symptom associated with the slightest rise in temperature, was considered to have malaria until the blood examination should prove the absence of this infection. Did the blood of these cases prove negative subsequent examinations were made during the ensuing twenty-four hours. It is presumed then that Dr. Hughes regarded the ailments to be of non-malarial origin, although this is not stated, but later in his article the absence of parasites alone does not seem to uphold this opinion with, in our opinion and experience, full justification. We may state at once that the absence of parasites, even after repeated blood examination during twenty-four hours, is not, in our opinion, a conclusive proof that malaria infection is absent in any given case. Dr. Hughes endorses this by admitting that cases are not infrequently met with, particularly in malignant infection, in which repeated examinations fail to show the presence of the parasite. This is a common experience, of course, where quinine has been taken prior to the blood examinations, but such instances do not wholly account for the many, many times the blood of patients subject to malaria shows no parasites on microscopic examination. The question naturally arises, therefore: Is the presence or absence of malaria parasites the only means of determining malaria infection? Dr. Hughes deals with this problem by remarking that a notable increase in the percentage of large mononuclear leucocytes in the blood is an almost constant feature in malarial cases. This is, of course, present in several ailments independent of malaria, and must only be accepted as diagnostic as part and parcel of a group of changes in malarial blood. To this is, however, to be added the presence of pigment granules in the leucocytes as another sign frequently met with in malarial blood, which serves to further help to the belief that it is a malarial infection we are dealing with. That we also meet with polychromasia of the red corpuscles in malarial cases is another commonly met with condition, but by no means characteristic of this infection, for it

is found in other ailments. It is, however, yet another addition to the group of conditions that obtain in malaria. Do these several entities combined suffice to justify the term "a malarial blood"? When parasites are absent, does pigmentation, the increased leucocyte count, the polychromasia, &c., allow us to conclude that the patient has had recent malaria or is still the subject of the disease? One fact stands out definitely, viz., that the absence of parasites alone is an unreliable test of the absence of malaria either recent or remote. The writer has been testing the subject recently. He has had the blood examined for malaria parasites, for several years, of persons returning to Britain after a stay of not less than three and up to thirty-five years' residence in a tropical climate in which malaria is known to exist. In all some 900 cases have been so examined, and during the past eight months every man and woman and (almost every) child have been examined by experts, including Dr. George Low, Dr. Manson Bahr, Dr. Castellani, in the laboratory of the School of Tropical Medicine, and by the experts in several of our accredited private public laboratories. The writer did not intend announcing these results until 1,000 such tests were made, but in connection with the subject raised by Dr. Hughes and other writers it may be stated that the proportion of malarial parasites actually found in these bloods works out at about 2 per cent. only. The cases were not selected; the examinations were made upon those who confessed to having had malaria and those, by far the larger number, who denied ever having had malaria. It is an extraordinary fact that some 5 per cent. only of the 900 questioned and examined confessed to having had malaria. They denied it perfervidly, scorned the idea in fact they ever had it, stated that they never had been absent from work for a day since they went to the tropics from malaria, and seemed to regard it as a slur upon the locality they lived in and upon themselves to merely suggest the idea. They led one to the conclusion that where to go to avoid malaria was to the tropics, and yet they gave harrowing accounts of what happens in other places from the disease; but on examining persons from these "maligned climates" the same tale is told: "We do not have malaria," it occurs to a great extent in the very regions where the formerly examined resident came from, and so on. It is the pot calling the kettle black principle, for both regions are known to be malarial, but the dweller therein will have nothing said against his "tropical home," and Scott's lines come up: "Breathes there a man . . . this is my own, my native land," &c., and I will not hear a word against it. The blood of the 900 cases mentioned was examined for parasites alone; and although Dr. Low on a few occasions mentioned it looks like "a malarial blood," it is evident that the test for inspection by the presence or absence of parasites is unsatisfactory and quite useless as a guide to treatment; a blood count is necessary, and the search for pigment and polychromasia must be made. In addition to the time and the expense involved in such an investigation, there is no guarantee that it is reliable; in fact, everything points the other way, and one has to come to the disappointing conclusion that we have no definite guide, nothing to point assuredly to present, recent, or more remote malaria infection, nor to latent malaria from the blood with no parasites.

One is glad to see that Dr. Hughes does not agree to the uselessness of quinine as a prophylactic with the light-heartedness that is found to be fairly widespread to-day. He is, in fact, strongly in favour of it. He advocates in the treatment of an acute attack of fever the administration of quinine at frequent intervals. He contends that a certain concentration of quinine is necessary, and this can best be obtained, owing to the fact that quinine commences to be excreted immediately after it is administered, by continued dosage. He recommends that a solution of 0·6 grm. of sulphate of quinine be given every four hours for a period of ten days, then twice daily for six weeks, and subsequently the daily dose at quinine parades.

An important point Dr. Hughes also mentions; it is that several of the commoner ailments met with in practice in regions where malaria prevails, such as convulsions, apoplexy, dysenteric symptoms, pneumonia, and a host of others, even boils, skin affections, &c., occurring in a patient who has been the subject of malaria, declared or otherwise, should be regarded with suspicion, and the possibility of the malarial parasite as a causative agent kept in view.

These rather elementary matters are drawn attention to in the hope that the question of "a malarial blood" be gone more thoroughly into. The attempt to diagnose the presence of malaria by searching for the parasites alone is practically useless in this direction. Is the "malarial blood" likely to prove a more hopeful test, and are the microscopic findings in the matter calculated to prove of more practical use in the recognition and the treatment of malaria?

J. Cantlie.

Spontaneous Pneumonia in Monkeys (Francis G. Blake and Russell L. Cecil, *Journal of Experimental Medicine*, May 1, 1920).—The authors came to the following conclusions: (1) Monkeys in captivity are subject to spontaneous lobar pneumonia. (2) Spontaneous lobar pneumonia in monkeys is caused by the pneumococcus. (3) Lobar pneumonia in monkeys may occur as an epidemic disease. (4) Spontaneous lobar pneumonia in monkeys is identical in its clinical features, complications and pathology with lobar pneumonia experimentally produced by intratracheal injection of pneumococcus and with lobar pneumonia in man.

Annotations.

A Contribution to the Arsenical Treatment of Leprosy (Alfonso de Nicola, *Giorn. Ital. d. Mal. Ven. e Della Pelle*, 1919, fasc. v, p. 378. The *British Journal of Dermatology and Syphilis*, vol. xxxii, No. 377, No. 3, March, 1920, p. 84).—The author has treated two cases of leprosy with novarsenobenzol with very good results. The author strongly recommends its trial in leprosy, and especially in the early stages of the disease. In his opinion it is the only drug which will arrest the evolution of the disease.

Practical Contribution to the Therapeutics of Epizootic Lymphangitis in the Horse (G. Ruggerini, *La Clinica veterinaria*, Nos. 1-3, pp. 1-10 and 69-83, Milan, January 15, 31, and February 15, 1919).—Amongst the diseases which have been very common among Army horses during the war the second place, after mange, belongs to epizootic lymphangitis.

The author briefly describes the various methods of treatment used up to the present, then deals with those applied by him to 315 horses, 180 mules and 17 donkeys at the Army Veterinary Hospital at Verona.

Among all the methods of treatment that which so far seems most preferable consists in combining surgical treatment of the lesions with careful antiseptic measures. There is no need to destroy one by one all the nodules present in the regions peripheral to the swollen glands; the extirpation of the glandular tumours diminishes the swelling of the hard nodules and prevents the formation of new ones. At the same time the treatment improves the progress of the wounds already present or derived from abscesses that are opened after extirpating the tumefied glands; even the diffused congestions begin to be absorbed after the operation, while the other lesions improve and heal.

The extirpation of lymphatic glands affected with slow cryptococcal infection is fairly easy and not dangerous. Iodine and arsenic are useful.

Pathology and Pathogenesis of Pneumococcus Lobar Pneumonia in Monkeys (Francis G. Blake, M.D., and Russell L. Cecil, M.D. The *Journal of Experimental Medicine*, vol. xxxi, No. 4, April 1, 1920, p. 445).—The investigation carried out by the authors tends to show that the pathology of pneumonia experimentally produced in monkeys by the intratracheal injection of pneumococcus is identical with the pathology of lobar pneumonia in man. The authors have found that the pneumococcus primarily invades the pulmonary tissue at some point or points in the portion of the lobe proximal to the hilum, that it spreads rapidly throughout the lobe by way of the perivascular, peribronchial, and septal interstitial tissue and lymphatics, quickly reaching the pleura, and that it invades the alveolar structure primarily by way of the alveolar walls, subsequently passing into the alveolar spaces simultaneously with the outpouring of exudate into the alveoli. It has been shown that the initial mode of invasion may be by direct penetration at one or more points into the walls of the bronchi near the hilum. The possibility that primary invasion may occur in terminal bronchioles, alveolar ducts, or alveoli of the parenchyma near the hilum has not been certainly excluded, though the evidence is against this supposition. In harmony with the mode of distribution of pneumococci it has been found that the initial lesions of lobar pneumonia are of the interstitial framework of the lung, with respect both to the grosser framework and to the alveolar framework. Hepatization begins centrally and spreads towards the periphery and is a constantly progressive process. With the development of hepatization the conspicuous interstitial lesions of the earliest stages gradually diminish, and are often largely masked when complete lobar consolidation has developed. Resolution is frequently accompanied by a varying degree of organization of the grosser framework of the lung. A variable amount of organization of the alveolar exudate also may occur.

Botulism, Preliminary Report of a study of the Antitoxin of Bacillus Botulinus (Ernest C. Dickson, M.D., and Beatrice M. Howitt, San Francisco, *The Journal of the American Medical Association*, Vol. 74, No. 11, March 13, 1920).—The authors have come to the following conclusions: (1) A true antitoxin may be prepared from the toxin of *Bacillus botulinus*. (2) There are at least two types of *B. botulinus*, which are distinct so far as their toxin-antitoxin relationships are concerned. (3) Experiments show that in the laboratory the antitoxin may protect against the action of the toxin for at least twenty-four hours after the administration of one test dose of toxin, but that the effectiveness is, to a certain extent at least, dependent on the amount of toxin injected. (4) For therapeutic administration a polyvalent antitoxin should be employed, and it should be given in large amounts and intravenously.

Production of Pneumococcus Lobar Pneumonia in Monkeys (Francis G. Blake, M.D., and Russell L. Cecil, M.D. The *Journal of Experimental Medicine*, vol. xxxi, No. 4, April 1, 1920, p. 442).—The authors come to the following conclusions:—

(1) Lobar pneumonia has been consistently produced in normal monkeys by the intratracheal injection of minute amounts of pneumococcus culture.

(2) The disease produced has been shown to be clinically identical with lobar pneumonia in man.

(3) Lobar pneumonia has been produced in the monkey in one instance by experimental contact infection.

(4) Normal monkeys inoculated in the nose and throat with large amounts of pneumococcus culture have failed to develop lobar pneumonia, though

carrying the organism in their mouths for at least a month. They have likewise failed to show any evidence of upper respiratory tract infection.

(5) Monkeys inoculated subcutaneously or intravenously with pneumococcus culture have in no instance developed pneumonia, but have either died of pneumococcus septicæmia or recovered without localization of the infection in the lungs.

(6) The pneumococcus is the specific cause of lobar pneumonia.

(7) The pneumococcus is unable to initiate an infection of the normal mucous membranes of the upper respiratory tract or to produce pneumonia following intravenous injection, but must gain access to the lower respiratory tract by way of the trachea in order to cause pneumonia.

(8) Lobar pneumonia is, therefore, bronchiogenic in origin.

(9) Invasion of the blood-stream by the pneumococcus in lobar pneumonia is secondary to infection of the lungs.

(10) The character of the leucocyte reaction during the course of lobar pneumonia bears a fairly definite relation to the course of the disease.

Studies on the effect of Light on Vitiligo (Carl With, *Brit. Journ. of Dermatology*, May, 1920).—According to the author's experiments, the carbon arc light produces upon the vitiligo patches a macular pigmentation more or less decided; it spreads from the periphery to the centre, and may last at least fourteen months. In three cases this pigmentary process continued after the light-bath had ceased.

The vitiligo patches react with a stronger erythema than the pigmented skin, but little by little the patients are able to stand a quantity of light, to which they formerly reacted with an erythema, not only upon the pigmented, but also upon the vitiliginous regions of the skin. Consequently the organism is capable of protecting itself against the light in another way than by pigmentation. The final proof that the rôle of the pigmentation is to form a protection against light has not yet been forthcoming. So many observations, however, go to show that it must be considered the most probable conclusion.

Results of Prophylactic Vaccination against Pneumococcus Pneumonia in Monkeys (Russell L. Cecil and Francis G. Blake, *Journal of Experimental Medicine*, May 1, 1920).—According to the authors' experiments pneumococcus vaccination does not protect monkeys against spontaneous or experimental pneumonia. The course of the disease is, however, modified, the blood infection is milder and the proportion of recoveries is considerably higher. Pneumococcus saline vaccine seems to be more efficacious than pneumococcus lipo-vaccine.

Abstract.

MIXED *B. PARATYPHOSUS* A AND B INOCULATIONS WITH SERUM-TREATED BACILLI[1].

By Capt. (Local Major) W. Broughton-Alcock.

Royal Army Medical Corps (Special Reserve), Officer in charge, Infectious Diseases Hospital Laboratory, Imtarfa, Malta.

Towards the end of October and early in November, 1915, it was noted that paratyphoid A and B fevers were being contracted by the personnel of the hospitals in Malta, where cases from Gallipoli were being received. It was then that I recommended and made a request through Colonel Gulland, A.M.S., to Surgeon-General Sir H. R. Whitehead, the D.M.S. Malta, that sanction might be given to prepare preventive paratyphoid inoculations and administer them on a voluntary plan.

In July, 1915, a mixed paratyphoid vaccine had been prepared and issued from the Vaccine Department, Royal Medical Army College, and Lieut.-Colonel Cummins had previously carried out some mixed *B. typhosus* and *B. paratyphosus* A vaccine inoculations at the Royal Army Medical College. The earliest employment of mixed enterica vaccine dates from Castellani's work in 1905, but for some unaccountable reason, and its falsity has been proved by experience, there existed in the minds of many a strong prejudice against paratyphoid inoculation because of the very severe reaction anticipated from the injection of *B. paratyphosus* B.

From comparative inoculation of fifty subjects following the injection of five different strains of *B. paratyphosus* B, obtained from blood cultures, I found that though two (one having been isolated as the causative micro-organism of an epidemic from food poisoning, and showing by the absorption test a certain relationship to the *B. aertryck* group) were extremely toxic to man as they were also to the mouse, yet the others were not so toxic. In the original researches the experience gained from the injections of the three latter strains led to the selection of one which gives but a mild reaction while promoting a rich response in antibodies for the several strains of the group tested (*Lancet*, September 24, 1914). In the same paper are given the initial experiences with the strain of *B. paratyphosus* A that was used also in the inoculation in Malta.

In the preparation of this mixed vaccine the strains employed were cultured separately on peptone agar in Roux bottles for twenty-four hours at 37° C., then washed off in 10 c.c. normal sterile saline, centrifuged and the deposit of the bacilli emulsified in 3 c.c. per Roux bottle of normal sterile saline. These emulsions were heated for one hour at 53° C. for *B. paratyphosus* A, and 56° C. for *B. paratyphosus* B. A platinum loopful thereof was then

[1] Abstracted from the *Journal of the Royal Army Medical Corps*, vol. xxxiv, No. 3, March, 1920.

taken and the number present per cubic centimetre determined by the Thoma-Zeiss counting chamber. Twice the quantity of inactive normal horse serum was added to each tube containing the emulsified bacilli. After one hour at 37° C. and a night in the ice-chest the tubes were again centrifuged and the deposit emulsified in normal sterile saline containing 0·5 per cent. carbolic acid, so that each 1 c.c. contained 1,000 million bacilli. A loss of 10 per cent. of the bacilli during the further preparation was allowed for. The emulsions of each strain were then mixed in equal proportions and, proving pure and sterile, were issued in 20 c.c. rubber-capped bottles.

Three doses ¼ c.c., ½ c.c., and 1 c.c. were recommended and given when possible, the interval between them being seven or eight days. Over 80 per cent. were so inoculated. The greatly diminished local reaction that follows the injection of these and other micro-organisms when treated with inactive normal horse serum has been discussed in a previous communication. It was again noteworthy. The number inoculated—2,531—included officers, nurses, non-commissioned officers, and men mainly of the hospital's personnel. The inoculations began in November, 1915, when Colonel Purves Stewart, C.B., A.M.S., joined me in being the first to receive the vaccine and our example was helpful in the plan of encouraging men to be inoculated. Within one month 2,000 persons had been inoculated or were willingly undergoing the inoculations.

These were carried out in various hospitals by medical officers specially detailed to do so and to make observations and forward them to me in the reports, which were summarized and sent to headquarters. Prior to undertaking this work these officers met, and details in connection with the preparation, doses, &c., of vaccine were explained. The ready collaboration and the interest of Officers Commanding hospitals and of these medical officers were of invaluable assistance and led to the high percentage of personnel inoculated, which in more than one hospital exceeded 90 per cent.

Reactions were mild or nil in all but twelve, and such results are of great importance when viewed from the administrator's and the subject's standpoint. Save for these twelve leave from duty for twenty-four hours was not necessary or requested. Four men showed what might be termed inoculation fever; this was characterized by a raised temperature beginning on the night of inoculation and lasting five or seven days, falling by lysis to normal. One man developed a scarlatiniform rash within thirty-six hours after the first, but had no reaction after the second injection.

As the inoculations were carried out during an epidemic of paratyphoid fevers and so few cases were reported amongst the personnel during their inoculations, such inoculations do not appear, in the doses given, to give rise to a negative phase in the subject. Three men during the course of their inoculations were bacteriologically proven to be suffering from paratyphoid fever, due to *B. paratyphosus* A (two), or *B. paratyphosus* B (one). The three recovered, and save in one case of *B. paratyphosus* A who had but ¼ c.c. of vaccine two days before the declaration of fever they had very mild attacks of the disease. In another hospital there were two other cases which were diagnosed on clinical grounds only, no confirmatory bacteriological evidence being obtained, as suffering from paratyphoid fever of exceptional mildness. These results, though the cases are few, point to no deleterious, and perhaps to a beneficial effect from inoculation early in infection. My results from the treatment of paratyphoid fever with serum-treated vacine further these premises.

An attempt was made to draw up statistical results from the incidence of paratyphoid fever amongst the inoculated and non-inoculated, but such has been unfortunately impossible with accuracy for several reasons, mainly the changes in personnel and the report of certain cases as "enterica" without classification. However, sufficient evidence could be gained from a survey of all cases during the three months prior and six months following the inoculations to show the total incidence of paratyphoid fever became to a definite degree quickly reduced. Infection in an inoculated person was of very rare occurrence.

Inoculations were given to 136 of the ship's complement during an epidemic of paratyphoid A fever on board H.M.H.S. "Panama" when at Malta. There followed an immediate cessation of the disease, and no fresh cases had arisen up to a month later when the last report was sent by the medical officer in charge. It must be added that special sanitary measures were adopted at the same time as the inoculations were begun.

Agglutination Findings.—From the agglutination test done by my time-governed slide method on a number of unselected inoculated people it was found that specific agglutinins for both *B. paratyphosus* A and B were detected in the blood on the sixth to eighth day. The specific agglutinins for *B. paratyphosus* A tended to disappear at about the sixth month, very rarely earlier, while those for *B. paratyphosus* B tended to disappear about the tenth or twelfth month after inoculations. There was a slight temporary rise in the specific agglutinin for B typhosus when previously present in response to earlier antityphoid inoculations.

NOTES ON MOUTH SEPSIS.[1]

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By oral sepsis we mean any infective or suppurative process going on within the buccal or oral

[1] New York Medical Journal, Vol. cxi, No. 16. Whole No. 2159, April 17, 1920.

cavity. These pathological conditions can be divided into two classes—namely, conditions affecting the gums and peridental membrane, such as the various forms of stomatitis and pyorrhœa alveolaris; and infective processes occurring around the apices of the teeth or apical infection.

Pyorrhœa Alveolaris.

Of the diseases of the gums and peridental membrane, pyorrhœa alveolaris is by far the most insidious and dangerous. Playing such an important rôle in oral sepsis, a brief consideration of its etiology, pathology and treatment is permissible.

Etiology.—The cause of this disease is not understood, yet we know that trauma in the form of ill-fitting crowns, ill-fitting fillings, tartar, clasps, and other mechanical devices play an important part in the etiology of this condition. Malocclusion of the teeth, infective organisms and systemic involvements are other etiological factors.

Pathology.—The disease can be grouped into two classes: (1) Suppurative, and (2) non-suppurative. The suppurative type has its inception at the gum margin. It first forms a condition known as gingivitis. As a rule trauma is a common cause of this phase of this disease. The peridental membrane is next involved, and as the inflammation continues, the membrane breaks down and pus appears. As the pus forms a liquefaction necrosis of the alveolus takes place, so that finally the tooth's investing tissues become destroyed, it becomes loose and is exfoliated. With the destruction of the peridental membrane and the alveolus a pocket is formed between the gum and the tooth, which is called a pyorrhœa pus pocket. The absorption of bacteria and their products from these pockets is great, and constitutes one of the greatest oral foci of infection.

Clinically we find the mucous membrane congested and the gums more or less tumified around the necks of the teeth. Pus can be squeezed from the pockets and the gums bleed freely. The patient will complain that they cannot brush their teeth because of the excessive bleeding. This type of pyorrhœa is the more dangerous of the two types because of the copious discharge of pus and the absorption from the pockets.

Treatment.—The treatment consists of radiographing all the teeth and determining which may be saved. Where more than half of the alveolus is destroyed the tooth had better be extracted. Those teeth that can be saved are relieved of all trauma. The tartar is thoroughly scaled away, all ill-fitting and irritating crowns and fillings are removed. Next the pyorrhœa pockets are curetted, all serumal calculus, necrotic peridental membrane, and alveolus are removed. Where the pocket is so deep as not to permit thorough curettage the overlying gum tissue is completely excised. This is by far the most positive way of clearing up the pus pockets. This is also done where the systemic condition is such that quick elimination of all foci is imperative. The operation is very simple. Under infiltration anæsthesia or nerve blocking with a 2 per cent. novocain suprarenin solution, the loose retracted gum overlying the pockets is excised, the line of incision following, as nearly as possible, the normal festoons of the gums. This incision is preferable to a straight one as the result has a better cosmetic effect. The area exposed is thoroughly curetted so as to remove all necrotic tissue. The wound is painted with Churchill's iodine and covered with a strip of iodoform gauze. The patient is given instructions in proper oral hygiene.

The choice between this operation and the scaling and curetting of the pockets is determined by the operator. There are many cases where this operation is uncalled for, where simple scaling and curettage of the pockets will accomplish the purpose. Then again there are cases where a combination of both these methods can be used. In cutting away the gum tissue the ultimate cosmetic result must be considered. Many times the labial muscles of the patient draw the lips up to such an extent that excising the gum may result in a rather hideous appearance. The one great factor is the eradication of the pockets, no matter how, as long as it is efficiently done.

Other Infections.

Of the other diseases of the gums there are the various forms of stomatitis. These do not have much bearing upon focal infection as they are not of long duration as a rule, and are eradicated before the system is altered by any absorption from these lesions. Before passing from this group of diseases of the gums a word or two must be said about an infection of the gums caused by the organisms of Vincent. This condition attacks the gum margin. At some point of lowered resistance in the mouth these organisms, the *Bacillus fusiformis* and the *Spirillum vincenti*, gain entrance into the tissues, incubate and multiply. A favourable site for these bacteria to lodge and become activated is under the flap of inflamed gum covering an erupting wisdom tooth, or in the pocket caused by an impacted third molar. The infection spreads along the free margin of the gum and around the necks of the teeth until a good portion of the mouth is involved. This infective process may extend backwards to the soft palate, fauces, tonsils and larynx, causing a severe angina with serious complications and creating a condition that closely resembles diphtheria. The gum margin becomes necrotic and the dead epithelial cells are thrown off, becoming enmeshed in a fibrinous exudate, and give the appearance of a grayish membrane. The patient feels quite ill and shows a temperature around 100° F. In some cases there is much difficulty in swallowing. The mouth is painful and the glands in anatomical relationship are usually involved.

The membranous appearance may simulate a purulent discharge, and this has led not a few dentists to call this disease pyorrhœa alveolaris.

Calling this condition pyorrhœa is a rather dangerous procedure, because the men that make this diagnosis are likely to treat it as such with serious results. The ordinary pyorrhœa treatment, which consists mainly in scaling, is absolutely contraindicated, because by using instrumentation of any kind during the acute attack we are likely to cause deeper infection of the tissues. A true Vincent's gingivitis attacks only the soft tissue. If neglected, secondary infection by the pyogenic organisms sets in and the alveolar process is destroyed. So we must be sure to make a proper differential diagnosis. The pseudo-membrane, glandular involvement, pain, and, most important, the bacteriological examination, and the finding of Vincent's organisms help us to differentiate it from an ordinary case of pyorrhœa alveolaris.

The treatment consists in antisepticizing the mouth. During the acute stages instrumentation is not indicated. The membrane is wiped away with sterile gauze and the ulcerated areas are painted with Churchill's iodine. The patient is instructed in oral hygiene. After the acute stage has passed the mouth is thoroughly cleaned and all infected gum flaps are removed.

Apical Infections.

Now we come to those pathological conditions occurring about the apices of the teeth. These infections constitute another form of oral sepsis. Together with pyorrhœa alveolaris they represent the two most serious forms of mouth sepsis. These apical infections are of both the acute and the chronic varieties. They are caused by infection through the root canal. In the acute variety the peridental membrane is overcome by the infecting organism with the accompanying pus formation. We also have all the symptoms of acute inflammation—namely, pain, redness, swelling and the accompanying manifestations. This type of the apical infection is the less insidious of the two, because there is fair warning that some abnormal process is going on and the patient attends to the condition, but the chronic form of apical infection is by far the more dangerous, and the one that we are most interested in.

These conditions are also caused by infection through the root canal. This type of inflammation is of the productive variety. Due to toxic irritation the peridental membrane proliferates, and this proliferation is called the dental granuloma, or under the old terminology, a chronic dento-alveolar abscess. These so-called granulomata are infectious, and cultures of *Streptococcus viridans*, *Streptococcus hæmolyticus* and other varieties can be grown from them. Histologically they possess a great many capillaries through which the bacteria and their products gain access to the blood and lymph streams. As these granulomata grow the centre breaks down and the lining membrane becomes of an epithelial character, and they become radicular cysts. These cysts at times assume large proportions.

The treatment of the apical infections is usually the extraction of the offending tooth and the thorough curettage of the sockets. The curettage of the socket is most important, as these granulomata are sometimes tenacious and do not come away with the tooth, but grow and continue to do as much damage as though the tooth had not been removed at all. I have seen many cases where these granulomata persisted after an extraction and developed into cysts, causing both local and systemic trouble. In anterior teeth the root canals may be thoroughly cleaned, sterilized and filled, and then the apex amputated, and the infected area curetted. No matter what the treatment is it must be thorough and radical. If the patient shows any systemic involvement we cannot temporize.

The results of oral sepsis may be local—that is, where neighbouring parts become involved through direct contact with infected material from pus pockets. Under this class of local contamination we have cases of pharyngitis, tonsillitis, and sometimes parotitis. This type of contamination is usually due to pyorrhœa. Gastritis and gastric ulcer are often due to direct extension of an infective process in the mouth. During the process of mastication the cheeks, lips and tongue, coming in contact with the gums, massage the pockets and squeeze the pus out of them. This discharge becoming mixed with the bolus of food is swallowed. Some observers may state that the antiseptic properties of the gastric juice deprive the swallowed material of any potency. We know that the gastric juices' antiseptic properties are due to the hydrochloric acid, and that hydrochloric acid is only produced during eating. What then sterilizes the swallowed discharge when one is not engaged in eating? In a large number of cases of malignancy of the stomach, F. St. J. Steadman, of London, reports that in every case of cancer of the stomach he has found chronic suppurations of the gums or pyorrhœa alveolaris.

Systemically, oral sepsis causes many obscure conditions. Due to the absorption of bacteria and their products from foci in the mouth we find conditions of arthritis, myositis, infective endocarditis and toxic neuralgias. These are only some of the disturbances caused by oral sepsis. The toxic neuralgias are very interesting. The writer has seen some very persistent cases of headaches almost miraculously disappear after the extraction of an infected tooth, or after the eradication of an old pyorrhœa. In some cases the results of eradicating oral sepsis have been little short of wonderful.

In conclusion it might be said that while a great number of teeth have been needlessly sacrificed yet the great good that has been done by the eradication of oral sepsis should not dampen one's ardour for eradication of focal infections in the mouth. Supposing the systemic affection is caused by a focus not situated in the mouth, and an oral focus was removed, what harm has been done? We have given the patient the benefit of the doubt, and a

focus of infection should be removed, whether it is causing immediate trouble or not. It may at some future time. If we have the welfare of the patient in mind, we should advise the removal of any affected area, no matter where it is, be it in the mouth, throat or prostate. The removal of vital and healthy teeth for the supposedly clearing up of an oral focal infection is gross ignorance and criminal malpractice and should be treated as such, but the removal of dead infected teeth or the clearing up of a pyorrhœa alveolaris can only be complimented and strongly advised.

SOME EXPERIENCES IN THE COMMONER TROPICAL DISEASES IN (LATE) GERMAN NEW GUINEA.[1]

By Laurence H. Hughes, M.B., Ch. M. (Syd.), Sydney.

(1) Malaria.

I am given to believe that, prior to the occupation by Australian troops and for some months afterwards, Rabaul and Madang, to take two of the main commercial centres of the possessions as an example, were both hotbeds of malaria. The advent of Colonel Strangman as Principal Medical Officer in November, 1914, and his crusade upon the mosquito wrought some marked changes for the better in regard to the prevalence of this disease. An outline of some of the methods adopted will be briefly touched upon later. In regard to the symptoms of the disease, those which occur during a typical attack are well known and need not be reiterated. One is struck, however, with the atypical manner in which the disease may present itself. For this reason every patient who came under observation, even though he complained of some apparently trivial symptom associated with the slightest rise in temperature, was considered to have malaria until the blood examination should prove the absence of this infection. In this way alone could possibly regrettable mistakes be avoided. Blood slides were taken as soon as possible after the patient was first seen. Should these prove negative, subsequent examinations were made during the ensuing twenty-four hours. Leishman's stain was used as a routine in all cases and gave very satisfactory blood pictures.

Diagnosis.—A word may be said here in regard to the diagnosis of malaria from the microscopical examination of the blood slide. The presence of the parasite in one of its numerous forms is, of course, the main positive evidence. But it is by no means the sole indication. Cases are not infrequently met with, particularly in malignant infections, and in those instances in which the patients have dosed themselves freely with quinine prior to examination, in which repeated examinations fail to show the presence of the parasite. A noticeable increase in the percentage of large mononuclear leucocytes in the film is, I think, of marked diagnostic importance in malarial infections. I made it a practice to carry out, when time permitted, a differential count in all blood smears examined, and found this increased percentage to be an almost constant feature in malarial cases. This leucocytic variation is not affected by quinine and, although sometimes found in other diseases, is a valuable indication of recent malaria. The presence of pigment granules in the leucocytes is another sign not infrequently observed in malarial blood. Polycromasia of the red cells is common, but the same condition is, of course, frequently seen in other pathological blood conditions. The tertian and subtertian parasites were those most commonly seen. Personally, I saw only one case of quartan infection. Mixed infections commonly occurred. In this connection it may be observed that, as the subtertian or malignant parasite is seen solely in its ring form in the peripheral blood during the early stages of infection, it is helpful from the point of view of subsequent treatment to discriminate between it and the ring form of the tertian or benign parasite. This is not always an easy matter, but I would mention the comparatively larger size and fainter staining properties of the infected red cell in the benign form, and especially the frequently found flattening of the chromatin in the subtertian ring as compared with the rounder dot-like form of the chromatin in the benign ring. The presence of the subtertian crescent form, of course, clinches the diagnosis of malignant infections, but it is rarely detected in the peripheral blood before the seventh day of the attack. Multiple infection of the red cell, i.e., the presence of two or more parasites in the one cell, is perhaps more common in the subtertian type, but is by no means diagnostic, as the same condition is frequently found in the benign form.

Treatment.—Treatment must be considered, firstly, from the point of view of prophylaxis, and in this matter much can be done to decrease the incidence of the disease. The main part of prophylaxis consists, of course, in the destruction of the breeding places of the mosquito and of the larval form of the insect. In New Guinea this work was carried out extensively and thoroughly by means of gangs of native work-boys under the supervision of medical orderlies. It consisted largely in the collection and destruction of all open receptacles that might hold fresh water. In a tropical country this is no mean task. In the first place the long Kunai grass, a pest in more ways than one in the possessions, has to be kept constantly cut in order to facilitate the search for empty cocoanut shells, bom-boms, or the boat-shaped, ensheathing leaves of the cocoanut palm, tins, sea shells, bamboos and other receptacles capable of holding water. In the bungalows sagging water spouts were a constant source of trouble and had to be regularly examined and rectified. Trees, especially paw-paws, fre-

[1] The Medical Journal of Australia, Vol I.—7th Year—No. 5, January 31, 1920, page 97.

quently had to be destroyed; in the case of shade trees, with which of course a conservative plan was adopted, gutterings in the trunks were made, or the hollows in the trunks filled up with cement. Tanks containing drinking water, and also collections of water which could not be drained, were treated twice weekly by applying kerosene to the surface of the water. Swamps, when practicable, were drained into the salt water. As regards other means of prophylaxis, mention may be made of the building of European dwellings at a safe distance from native villages, the use of mosquito nets and the prophylactic use of quinine. Quinine parades were held daily, and 0·3 to 0·6 gramme doses, according to the prevalence of infection, issued to each man. Much has been written for and against the prophylactic use of quinine; personally, I am strongly in favour of it. The treatment of an attack of malaria, once it is established, consists mainly in the exhibition of quinine. In regard to this matter it must be remembered that we aim at destroying the parasite in the blood; consequently a certain concentration is essential. Furthermore, when quinine is administered by the mouth its absorption into the system takes some time, and almost simultaneously with absorption excretion of the drug begins. On these grounds the administration of large doses at frequent intervals seems to be theoretically advisable. From a practical point of view it certainly proved the most satisfactory method in New Guinea and was adopted as a routine procedure. A solution of 0·6 grm. of sulphate of quinine was given every four hours for a period of ten days, then twice daily for six weeks, and subsequently the daily dose at quinine parades. The solution is the surest form in which to administer quinine by the mouth. Tabloid and pill preparations are not to be relied upon, and capsules or cachets are unsatisfactory. Intramuscular injections were also made use of in cases when quinine for some reason could not be given by the mouth and as an adjunct to oral administration in malignant cases. In addition to quinine treatment a course of soamin injections, 9·18 grm. every second day for ten doses, was given after the second week. This treatment, however, was abandoned during the early part of last year, and intravenous injections of arsenobenzol were given with more satisfactory results. Two injections were given, one 0·4 to 0·6 grm. during the second or third week, and the second, 0·6 grm., a week later. It was, of course, impossible to ascertain its effect as to the ultimate destruction of the parasite, owing to the possibility of re-infection, but its general and tonic effects were most marked in many cases. X-ray exposures of the spleen were carried out largely in Rabaul, but I am unable to speak from experience in this matter. Before leaving the subject of malaria, mention should be made of some of the commoner diseases which it not infrequently simulates in its malignant form. Cerebral symptoms, e.g., coma, convulsions or apoplexy, dysenteric symptoms and pneumonic symptoms, occurring in a patient who has been infected with malaria, should be regarded with suspicion, and the possibility of the malarial parasite as the causative agent kept in view.

(2) Blackwater Fever.

This disease is closely associated with malaria in some of its manifestations. It does not seem possible, however, that it is caused by infection with the malarial parasite. It is true that in some cases of blackwater we find malarial parasites in the blood. But many other illnesses will provoke an attack of malaria in a person in whom the parasite is latent. Then, again, there are the cases of blackwater fever in which conclusive evidence of malarial infection is wanting Of ten cases which came directly under my observation malarial parasites were found in two. Furthermore, it must be noted that the presence of hæmoglobinuria, detected by the spectroscopic test, is a cardinal point in the diagnosis of blackwater fever, whereas it is never present in malaria. Another theory that has been advanced is that this disease is caused by quinine. This may be tenable in regard to the provocation of an attack of blackwater by the administration of quinine to a patient in whom the disease is already latent, in which case the connection between the disease and the quinine is one of coincidence. In regard to this theory mention may be made of the bearing which irregular dosing with quinine possibly has on the incidence of blackwater fever. I saw no cases of the disease amongst the troops in New Guinea; my experience in it was limited to cases amongst the German residents and the Japanese, Malay and native races. As has been mentioned previously, the troops were supplied with a daily ration of quinine, whereas in the case of the other people alluded to quinine was, as a rule, taken more or less irregularly, until an attack of malaria was responded to by large doses of quinine, and followed not infrequently by the manifestations of blackwater fever.

Treatment.—Treatment is mainly symptomatic, accompanied by the frequent administration of large amounts of fluid by the mouth or per rectum. In the latter instance 250 to 500 c.c. of saline solution should be administered as an enema every hour. If these are not retained, subcutaneous injections of saline solution should be resorted to. The desideratum is to keep the renal tubules well flushed. The administration of quinine to these patients needs careful handling and caution must be exercised. If the blood examination be negative for malarial parasites it should be withheld. If parasites be present it should be administered in tentative doses, due attention being paid to the extent of the hæmoglobinuria present and to the intervals at which it recurs. In this respect it may be suggested that when the hæmoglobinuria is pronounced, it is reasonable to suppose that the hæmolysis is carrying on the work of quinine in regard to the destruction of the parasite and the exhibition of the drug is not indicated.

(3) Dysentery.

The two main types of this disease that were met with were the amœbic and bacillary forms, though occasionally cases that were apparently purely malarial in origin were seen. I saw no cases of a bacillary infection alone amongst the white population, whereas this type predominated amongst the coloured races. Occasionally mixed infections occurred amongst the troops; but in my experience the amœbic type was much more common. The diagnosis of the latter, apart from the difference in the nature of onset and general symptoms, is, of course, confirmed by the finding of the *Amœba histolytica* in the infected stool. It is to he distinguished from the non-pathogenic *Amœba coli*. The main points of difference are the smaller size of the histolytica, the clearer differentiation between its ectoplasm and endoplasm and its eccentric, indistinct nucleus as compared with the central, clearly-defined nucleus of the non-pathogenic form. Finally, the cystic form of *A. coli* contains eight amœbæ, whereas the cyst of *A. histolytica* contains hut four and the refractive chromidial bodies as well. Prophylactic measures were, of course, adopted in regard to drinking water, the eating of uncooked fruit and vegetables, and the immediate disinfection and disposal of excreta. A condenser was installed in Rabaul, and from this the troops were supplied with drinking water. On the outstations the boiling and filtering of the water were substituted. As regards treatment I made it a practice in all cases to begin with an initial dose of 15 to 30 c.c. of castor oil, with 0·6 mils of tincture of opium; during the attack the bowels were regulated by means of castor oil and salines. In bacillary cases the sulphate treatment was adopted from the outset. In amœbic infections a course of emetine injections, 0·02 grm. hypodermically three times a day for ten days, was given. Owing to the scarcity of supplies of emetine bismuth iodide I only had the opportunity of using it in three cases, and can consequently not speak from experience in regard to it; but recent observations, e.g., those of Dobell recorded in the *British Medical Journal of* November 4, 1916, give apparently conclusive evidence as to its superiority in these cases. I saw hut one case of hepatic abscess complicating amœbic dysentery. I may mention that cases were occasionally seen which presented symptoms of severe diarrhœa somewhat simulating dysentery, but without the presence of marked tenesmus or of blood in the stools. The latter contained numerous yeast cells and tyrosin crystals; the condition improved under the administration of chrome santonin in 0·06 grm. doses three times a day for three or four days. The condition is probably a mild type of sprue, though no other symptoms of typical sprue were manifest.

(4) Ankylostomiasis or Hookworm Disease.

The disease is prevalent in certain parts of these possessions, and it is very probable that if a thorough investigation were carried out, such as was done in Papua, a large percentage of the native population would he found to he infected. Numerous natives from plantations in the vicinity of Rahaul were examined, and the ova of ankylostomum found in the stools in a large percentage of them. In regard to symptoms, the combination of epigastric pain and symptoms indicative of derangement of the digestive organs, together with a well-marked anæmia, is always strongly suggestive of the disease. Two signs which were commonly noted in the natives were a peculiar dry lustreless, exfoliating condition of the skin and a prominent abdomen, the latter being due to ascites. The outstanding feature of the blood examination is the anæmia, accompanied by a well-marked eosinophilia, though the latter is sometimes not present. Neither anisocytosis nor poikilocytosis was observed. The diagnosis is confirmed by the microscopical demonstration of the ova of ankylostomum in the infected stool. These are oval and thin-shelled, and show a wide, clear zone separating the shell from the central granular portion, which is characteristically divided into four segments. The ova of ankylostomum may be confused with those of *Oxyuris vermicularis* or common thread worm, hut it is to he noted that the latter are smaller and asymmetrical, one side being more curved than the other, that they have a doubly-outlined shell, and that they contain an embryo which is almost or already completely developed. Treatment was carried out by the administration of calomel and salines, followed on the ensuing day by 1 grm. of thymol, and another gramme half an hour later. A purgative was again administered five or six hours afterwards and the stools examined for the mature worm. Oil is a solvent of thymol and should not be given during the course of the treatment, which is carried out at weekly intervals until a negative result is obtained.

THE OPERATIVE TREATMENT OF ULCERATIVE COLITIS.[1]

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Some of the worst cases of ulcerative colitis are those in which the chronic condition is secondary to an acute epidemic form such as amœbic or bacillary dysentery. There is a certain similarity between these cases and the ordinary form of chronic phthisis. In both we find an acute specific infection causing lesions which become secondarily infected with other septic organisms, and it is this latter secondary infection which causes much of the trouble.

These cases of chronic ulcerative colitis are par-

[1] *British Medical Journal*, No. 3093, April 10, 1920, page 497.

ticularly important at the present time, because very large numbers of men have been infected with acute dysentery while fighting at different parts of the front during the last five years, and are now suffering from the chronic and often much more serious condition.

Not only have a large number of these cases returned to this country during the last eighteen months, but quite a considerable number of cases have occurred among men who have never left England, and among women. These latter cases do not start with acute amœbic dysentery, but are chronic from the beginning. I have little doubt, however, that they have in many cases become infected from the class of cases first mentioned. This is rather borne out by the fact that several cases of ulcerative colitis which came under my observation last year came from one seaport town where many troops from abroad were landed.

A typical case would be that of a man who contracted acute dysentery in Africa or Arabia during the war and had been more or less successfully treated at the time, but the diarrhœa has recurred subsequently until it has become almost continuous, and he has gradually begun to go downhill with constant liquid blood-stained stools, progressive loss of weight, failure of appetite, &c.

An examination with the sigmoidoscope (the value of which in these cases as a means of diagnosis does not even yet appear to he fully appreciated) shows deep and extensive ulceration of the mucous membrane of the rectum and colon. In a bad case islands of mucous membrane can be seen standing up from the ulcerated surface, presenting an appearance closely resembling a polypoid condition.

Examination of the stools shows numerous bacteria, mostly of the coli or streptococci groups, but no sign of protozoa.

The clinical history of cases of ulcerative colitis varies considerably. In those cases in which the disease is not secondary to acute dysentery the condition often starts insidiously. The patient appears to recover satisfactorily from the initial attack, but recurrences become more and more frequent and less amenable to treatment, until the condition becomes so serious that no treatment seems to have any effect. It is generally at this stage that the surgeon is called in.

There may sometimes be confusion between chronic ulcerative colitis and other forms of chronic recurring diarrhœa, but this can at once be cleared up by an examination with the sigmoidoscope. In true ulcerative colitis the temperature is almost always raised 1° to 2° F. at night. Blood is more or less constantly present in the stools, and wasting is a marked feature of the case.

The best treatment for an ulcerative colitis is appendicostomy, and I have seen very many really desperate cases recover as a result of this operation, which I and those associated with me were certain must otherwise have died. Unfortunately the surgeon is too often only called in when the patient is already seriously ill and the ulceration has become very extensive. The operation should be performed at a much earlier stage of the disease, and recovery would be then much more rapid and more certain.

In true ulcerative colitis non-operative treatment appears to be of very little use. Even when recovery does occur it is a slow and tedious process. One of the reasons for this is that the ulcerated surface is very large and cannot be directly dealt with. Douches and enemas cannot be tolerated in sufficient quantities to ensure that they reach the whole of the diseased area.

Appendicostomy acts in two ways. The first and most important action is to allow of the large ulcerated area being kept cléan and free from pus and accumulated discharge. The frequent washing of the colon by removing the products of inflammation allows the ulcers a chance to heal, and to a large extent prevents the absorption of septic by-products into the blood.

The second important action is to compensate for the great loss of body fluid, which is always present owing to the constant diarrhœa. Many of these patients are wasted till they are little more than skin and bone, and it is often quite remarkable to see the improvement that follows frequent irrigation of the colon through an appendicostomy opening.

As already stated, the proper time to perform appendicostomy is as soon as the condition has been diagnosed; but in practice it has been my experience that the surgeon is usually not called in until medical treatment has been tried for months and failed. Then when appendicostomy is suggested it is argued that the patient is in such a poor condition that he will not stand the operation. This is, however, not the case, as the operation can quite well be performed under local anæsthesia without running any risk at all.

In a bad case the patient should after the operation be treated by continuous saline irrigation for six or eight hours at a time. This is easily arranged by using a metal bed-pan with a tap and a rubber tube attachment. Very careful nursing is, however, necessary to prevent the formation of bedsores.

As soon as the diarrhœa has been checked and improvement has set in, a 3- or 4-pint wash through twice or three times a day will be sufficient. On no account should any antiseptic be added to the fluid used for irrigation, as poisoning symptoms are almost sure to result. Solutions of silver nitrate and protargol can be used, but in the case of the former only for a short time. I have seen a very bad case of staining of the skin with silver which resulted from frequent washing through with silver nitrate. Salt water seems to give the best result in most cases.

There still are people who think that an appendicostomy opening is an objectionable thing and that it results in the escape of gas and fæces. This

is, of course, not the case with a properly made opening. In ulcerative colitis the opening should be kept patent for at least six months after all symptoms have subsided, but after this it may be allowed to close, which as a rule it will readily do.

Conclusions.

(1) Chronic ulcerative colitis is a very serious and often fatal disease.

(2) The best treatment is by frequently washing through with saline solution after an appendicostomy opening has been established.

(3) The operation should be performed as soon as a diagnosis has been made and not left as a last resort, although it may sometimes succeed even then.

(4) The diagnosis should always be confirmed by sigmoidoscopy.

THE BIOLOGICAL CLASSIFICATION OF INFLUENZA BACILLI.[1]

By T. M. Rivers.

Many people have never felt absolutely certain that the difference between *Bacillus pertussis* and *B. influenzæ* were sharp enough to be beyond doubt, in spite of the serological proof. *B. pertussis*, after a period of artificial cultivation, can be grown on plain media, forms no indol, no nitrites, and makes milk very alkaline. Some of the influenza bacilli also form no indol and no nitrites, but none of them has ever made milk nearly as alkaline as *B. pertussis*.

Time alone will tell whether these cultural characteristics will be constant. While there are differences in the biological activities of the various strains of *B. influenzæ* at the same time there are definite groups, the individual members of which are similar culturally. Only one group will be discussed at this time. It consists of ten strains, five from the spinal fluid of patients with influenza meningitis, two epidemic strains from New York, and three from normal throats. The growth and morphology of these are similar, all from indol, all reduce nitrites to nitrates, and make blood-broth milk slightly acid within forty-eight hours.

Whether the strains of large bacilli that are amylase formers, or the hæmolytic ones, should be included in this big influenza group is a question that will have to be decided. The nine amylase formers and three hæmolytic strains have characteristics in common with the big group, as shown by certain ones forming nitrites and by one of the hæmolytic strains forming both indol and nitrites. Possibly this is a big group or organisms, like the streptococci, which have been divided into hæmolytic and non-hæmolytic strains, and further subdivided by cultural characteristics and serological tests. Possibly the group can be compared with the Gram-negative diplococci, meningococci, parameningococci, *Micrococcus catarrhalis*, *Micrococcus flavus*, *Micrococcus pharyngis siccus*, gonococcus and others.

Conclusions.

(1) The Gram-negative, non-motile, hæmoglobinophilic bacilli can be classified biologically by reactions which admit of subdivisions of the group.

(2) In working with a suspected *B. influenzæ*, the following routine should be followed: (*a*) Determination of hæmoglobinophilic qualities. (*b*) Colony formation. (*c*) Hæmolytic test. (d) Gram stain. (*e*) Morphology. (*f*) Motility. (*g*) Indol formation. (*h*) Reduction of nitrites to nitrates. (*i*) Amylase formation. (*j*) Reaction in blood-broth-milk.

(3) *B. pertussis* can be differentiated from the group of *B. influenzæ* by cultural characteristics.

[1] *Bulletin of the Johns Hopkins Hospital*, Vol. xxxi—No. 348. Baltimore, February, 1920. page 53.

Medical News.

Veterinary Surgeon James Brand, F.R.C.V.S., in a letter to the *Times*, from Nigeria, states that in trypanosomiasis of horses he has obtained remarkably good results by giving ten intravenous injections of an equal parts mixture of a 1 in 100 watery solution of methylene blue, made from a saturated alcoholic solution of the dye, and a 1 in 500 watery solution of corrosive sublimate. The dose is 10 c.c., which is given daily direct into the blood-stream. It is suggested that this treatment will be found useful for all animals suffering from trypanosomiasis, and for sleeping sickness.

Dr. Sandes, in an address delivered at the annual meeting of the New South Wales Branch of the B.M.A., made the suggestion that there should be a "Federal Minister of the Red Cross," whose department should be charged with the work of co-ordinating preventive medicine measures.

The Medical Research Council have made arrangements with the authorities of the Lister Institute (Chelsea Gardens, London, S.W.) to maintain a collection of type cultures of the principal pathogenic bacteria and hyphomycetes. Cultures will be supplied to scientific workers at a small charge to defray the cost of media and postage.

The President of the French Republic has conferred the honour of Knight Officer of the Legion of Honour on Dr. Aldo Castellani, in recognition of his discovery of the combined typhoid + paratyphoid A + paratyphoid B vaccine and the enteric + cholera vaccine, adopted during the war by the Allied Armies.

Original Communications.

THE TREATMENT OF BILHARZIASIS WITH ANTIMONY.

By J. E. R. McDonagh, F.R.C.S.
Hunterian Professor R.C.S., Surgeon London Lock Hospital.

My original reason for using antimony in bilharziasis was because I found this metal to succeed in three cases of sleeping sickness I was treating in 1910 and 1911, when it was not practicable to prescribe further injections of arseno-benzene, and because I had found arseno-benzene to be useless in two cases of bilharziasis. I treated my first case of bilharziasis with intravenous injections of tartar emetic in 1911, and first drew attention to the use of the drug in this disease in my "Biology and Treatment of Venereal Diseases," which was published in 1915. At about the same time I found tartar emetic to be the most useful drug in *ulcus molle serpiginosum*, one of the most chronic conditions known, and later that antimony had its uses in certain chronic cases of gonorrhœa. So far as protozoal and bacterial infections are concerned antimony appears to be the best metal to employ in those cases where the organism is intracellularly situated.

In such infections antimony acts indirectly on the parasites by stimulating the oxidizing action of the protective substance—the protein particles in the serum—but whether this is the way it acts in bilharziasis, or kills the worm directly, is a point not yet settled. I have used three preparations of antimony: (1) tartar emetic, (2) antiluetin, (3) colloidal antimony, and although all three have much the same action, tartar emetic is the drug for choice as being the most convenient to use. Antiluetin is difficult to obtain, and colloidal antimony, which is antimony sulphide, has to be freshly prepared, as it is not a particularly stable colloid. Owing to the severe pain all these preparations cause when injected intramuscularly, it becomes practicable only when many patients are being treated, and as many injections are required for each to rely upon intravenous injections of tartar emetic. I have ampoules made up containing 1·0 c.c. of distilled water and 1 to 1½ grains of tartar emetic. It is best to dilute the contents of one ampoule with water and inject about 100 c.c., as concentrated solutions are apt to cause venous thrombosis and temporary mild shock, which is exhibited by violent fits of coughing, feeling of constriction around the neck, with occasional swelling of the lips and tongue.

Ten injections prescribed at about five-day intervals is the average number required. The bleeding begins to stop after the first injection or two, and the ova to gradually disappear as the injections are continued. In all I have had 22 cases under treatment; 7 came from Egypt and the rest from South Africa, and 5 were sent to me as intractable cases of gonorrhœa. In all intravenous injections of antimony caused an improvement, 2 of the cases have since relapsed, 11 of the cases I have lost sight of, but I hear periodically from the other 9 and so far they have not relapsed, the oldest case having received treatment eight years ago.

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BILHARZIA DISEASE: THE STERILIZATION OF THE OVA DURING THE COURSE OF CURE BY ANTIMONY (TARTRATE).

By J. B. Christopherson, C.B.E., M.A., M.D., F.R.C.P., F.R.C.S.
Consultant Tropical Diseases Clinic, Ministry of Pensions.

In the Journal of Tropical Medicine and Hygiene articles have been published from time to time confirming the statement that antimony introduced into the veins of a patient with bilharzia disease kills the bilharzia worms in the portal circulation and cures the person. There seems to be little doubt about this, in fact it appears to be a remarkably sure remedy.

Your correspondent, Dr. F. G. Causton[1] confirms the statement which the writer has made[2] that antimony tartrate may and should be given in cases of bilharzia disease complicated by conditions which are not of themselves bilharzia though arising from it—albuminuria, fistulæ, stone and renal complications. It should be used in complicated cases with more caution however, as befits the treatment of cases of greater gravity. That it may be used in complicated cases is an important statement, because the cases which come up for treatment in a country such as Egypt where bilharzia is endemic are many of them complicated and, serious as the disease is, as met with in England, it is many times more so in these countries, where people are exposed to infection and reinfection almost daily, and where something like 10 per cent. of the total mortality is due to bilharzia disease and its complications.

There are several points open to discussion with regard to the administration of this remedy. Two of them are:—

What is the required dose?

How is the dose determined?

Your correspondents do not state how they determine when a patient is cured, and therefore when the injections may be stopped. My own view is that it has not much to do with the presence or absence (*per se*) of the ova, but it has to do with the condition of the ova coming away.

The disappearance of the ova from the urine at an early period of the injections is certainly remarkable, and requires explanation—it suggests direct action on the ova; they may *seem* to disappear altogether, after a few grains of antimony (tar-

[1] Journal of Tropical Medicine and Hygiene, September 15, 1919, and March 15, 1920.

[2] Journal of Tropical Medicine and Hygiene, July 15, 1919, p. 138.

trate) have been injected, or they may remain plentiful, until close on 30 gr. have been injected.

The disappearance of the ova during the course of injections is caused by the injections—still the fact itself has nothing to do with determining the dose necessary for the patient, or with the determining the time when injections may be suspended in any particular case.

I lay stress on this point, because if it can be shown that antimony not only kills the adult bilharzia worms but that it also sterilizes the ova, which the worms have deposited in the bladder and rectum. I think there is reasonable hope of eliminating endemic bilharzia disease by means of antimony (tartrate) for as time goes on and the proportion of cured cases increases in an affected country, the intermediate hosts will have difficulty in the supply of raw material for the extra-corporeal cycle. The fact that antimony is prophylactic in its action therefore is a very important one.

For bilharzia disease can by this means be eradicated from countries in Africa where it has now a firm hold on the population, Egypt and adjacent places—East Africa, Nyassaland, South Africa.

And in countries such as Australia where "its disabling effects are sufficiently serious to cause uneasiness lest it becomes prevalent," the importance of this prophylactic action cannot be overstated.

It is definitely established that the molluscs capable of acting as intermediate hosts are plentiful in South Australia, and other parts of the Commonwealth.[1]

It therefore behoves Australia not to allow those molluscs to be infected with bilharzia. This may be accomplished by compulsory treatment of infected soldiers by antimony (tartrate), and by continuing the treatment of cases until the ova are granular.

Now although the ova apparently disappear from the urine during the course of injections, they do not do so altogether.

If the urine be examined daily and systematically—I should like here to acknowledge the help I had from two skilful workers in this department of my work, Mr. J. R. Newlove of the Khartoum Civil Hospitals and Mr. H. R. Johnson of the Tropical Disease Clinic at the Ministry of Pensions, Cheltenham Terrace, London—it will be found that at a certain period (varying) annually I think after a total of 10 gr. of antimony tartrate have been injected, that some of the ova coming away are altered. They are becoming granular, shrivelled, blackish in colour, their double contour is disappearing and they do not hatch—they are sterile.[2] When the ova examined for several days in successive specimens of urine are all sterile, then I think the injections may be suspended, for the worms are dead (they die early in the course) and the patients have ceased to be carriers of the disease, for the ova are sterile and although they still periodically appear in the urine and will do so for months and perhaps years, they cannot infect the intermediate hosts.

This point (when all the ova are sterilized) is not, always, an easy one to determine, because they become very scanty in number during the course and are only found periodically. They are found in shreds of tissue ulcerating from the inner surface of urinary passages.

I am not sure that it is practicable to use this method at all in cases of bilharziasis of the rectum or even in some cases of mild infections of the urogenitary tract.

It becomes therefore necessary to look for other means of ascertaining the required dose. (1) Colonel Hamilton Fairley's complement-fixation reaction may prove useful, in places where the antigen is obtainable easily (e.g., Egypt and S. Africa) though it has not yet proved to be of practical application; the real difficulty in applying this method will lie I think in procuring snails for the manufacture of the antigen. (2) Eosinophilia at first increases during the injections and afterwards decreases and should in an uncomplicated case disappear,[1] but the presence of other intestinal parasites interferes with this test. From this clumsy and not too exact method not much help is to be expected in determining the time to stop injections. Therefore it is my opinion that the microscope is the most practical means we have for determining the quantity of antimony (tartrate) necessary to inject and its effect. The urine should be frequently examined by the ordinary clinical tests, especially for albumin, to ascertain the effect of the antimony on the renal epithelium.

Based on the result of treatment of a good many cases where careful observations were made up to a maximum of two years from the time of injection, my opinion is that the dose of antimony tartrate required for an adult is between 20-30 gr., and that it is generally nearer 20 than 30 gr.

In the case of an otherwise healthy adult—uncomplicated by fistulæ, stone or renal complications—if I do not find ova in the urine to guide me I fix the dose at 25 gr. In complicated cases the dose, needless to say, should be smaller.

Antimony tartrate is no doubt a dangerous drug when given by the mouth and considerable caution should be exercised in administering it intravenously, until further facts are known regarding its toxicity when introduced in this way. We know however, that considerably more than a total of 30 gr. may be injected and indeed are necessary in cases of kala-azar.

The writer has given 89 gr. antimony tartrate in 115 days to a Sudan boy of 18 suffering from kala azar—he was cured and afterwards accepted

[1] *The Medical Journal*, Australia, September 27, 1919, p. 259.

[2] Crystals—oxalates urates, mucin particles and the débris found in urine become blackish during the antimony injections.—J. B. C.

[1] JOURNAL OF TROPICAL MEDICINE AND HYGIENE, July 15, 1919, p. 143.

for service by the Sudan Government and was two years after injection classed fit and well.[1] I do not quote this case as a precedent for giving large quantities in bilharzia—kala azar and bilharzia are two very different diseases and require different doses. I am quite prepared to admit that regarded in comparison with the lethal doses of the drug by the mouth,[2] the dose 20-30 gr. appears to be "perilously high," but I think that, in order to obtain the full advantage (prophylactic) of the course of A.T. you must inject till the deposited ova are all "granular." If this does not take place before 30 gr. then I think it best to suspend operations and later on give a second course if necessary (as a matter of fact, all my cases of bilharzia have been cured before 30 gr. have been reached).

I am aware too that the pathological changes said to be found after acute antimony poisoning include fatty degeneration of the glandular organs and C.N.S. I therefore have always maintained that the remedy should not be placed in the hands of Bob Sawyers, and I believe that the operation, though small, requires skill and care and judgment and that the patient should constantly be watched for symptoms of over dose. It is needless to say that although the injections may be given in outpatient practice they should be given with care. Acquaintance with the case by thoroughly examining before commencing injections will place the operator in a sound position and, especially, examination of urine is necessary to determine whether the albumin present is due to blood or to renal inadequacy.

Further we know that a good proportion[3] of the antimony given is eliminated by the kidney; we may assume therefore that toxic effects on the internal organs will be early shown in the urine; the urine should be examined daily for albumin. I am of opinion that a small amount of albumen (not accounted for by the presence of blood in the urine) does not signify much. It will disappear when the injections are suspended but not before. If, however, the albumin increases—one would want to know—does this indicate changes in the renal epithelium? If one cannot give a satisfactory answer to this question one must suspend the injections.

Moreover any symptoms, such as jaundice, intervening would cause one to suspend injections.

In this communication the writer has emphasized three points:—

(1) The prophylactic action of antimony (on the ova). Because, if this point can be sustained, then the intravenous injection of antimony promises to be a direct means of eradicating bilharzia disease from countries where it is endemic.

(2) That the dose is not a constant one fixed at 20-30 gr. or less; watch the ova and inject until they are all granular, when this has been accomplished the proper dose is reached—this is of special importance in countries like Australia where the intermediate hosts exist but are not yet infected.

(3) That the injections call for a considerable amount of judgment and care and require a sense of responsibility in the administration. As little antimony should be used as is necessary to accomplish the effect on the ova.

Experimental Studies in Diabetes (F. M. Allen *Journal of Experimental Medicine*, vol. xxxi, No. 5, May 1, 1920).—Practically every detail of clinical diabetes can be produced in partially depancreatized animals. They are susceptible to acidosis and coma, and present anatomical changes in the islands of Langerhans. They show at first a tendency to regain assimilation comparable to that seen in the early stages of human diabetes, and sometimes recover so as to be able to endure any degree or duration of carbohydrate feeding, and can be made diabetic only by removal of additional pancreatic tissue. Similar recovery in some human cases, especially after acute pancreatitis, is a probability. This recuperative tendency can be negatived by overfeeding, even without glycosuria. With duration of the diabetes the power of recuperation diminishes or disappears as in human cases. In the absence of progressive pancreatitis or other extraneous causes, these animals show no inherent downward tendency in their assimilation, which fits them for further accurate feeding experiments. Every detail of the downward progress of human patients on various diets is reproduced in such animals. They lose assimilation and die most rapidly on diets rich in carbohydrate, and less rapidly on excess of other foods. The differences between sugar and starch or between starch and protein are not absolute, being only those of degree and time. The downward progress is purely the result of over strain of the internal pancreatic function by excess of food. The benefit of the classical treatment by exclusion of carbohydrate and limitation of protein is confirmed. In the majority of cases the results are not permanent. Diabetes of great severity is controllable only by radical undernutrition. In still more severe cases glycosuria can be abolished only by such undernutrition as to entail death from inanition. In the most severe cases glycosuria cannot be stopped as the food derived from the body stores in fasting cannot be disposed of.

Some Interesting Instances of Tuberculosis in Animals (J. B. Cleland, *Medical Journal of Australia*, vol. 1, No. 2, March 13, 1920).—Tubercular meningitis was found in a Malayan bear, and in a hulldog granulomata were found in the lungs, liver, spleen and lymph glands, which, though devoid of giant cells, contained tubercle bacilli.

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[1] 24/1/20.

[2] The Pharmacopœia dose of antimony tartrate is gr. ½.

[3] JOURNAL OF TROPICAL MEDICINE AND HYGIENE, July 15, 1919, p. 144.

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JULY 1, 1920.

HOUSING AT HOME AND ABROAD.

IN Britain just now the housing of the people is causing keen anxiety. The scarcity of house accommodation, be it hotels or private houses, is acute. The cause is multiple; but to no single factor can be ascribed the cause of the difficulty, there are major and minor idiosyncrasies due to the upset for the past few years of the ordinary course of life. The number of houses are really not less than before the war, for no one was allowed to pull down a house, nor were they likely to do so, for any dwelling, however dilapidated, was welcomed, if only for the mere shelter it could afford from the elements, and the proprietor obtained a rent much above anything expected when the house was new. The population has not actually increased, for well-nigh a million of men were killed during the war, which would more than cover the normal increase of population.

Since the war the marriage rate has mounted up rapidly, and the newly married couples require more houses. The Government has taken over hotels, clubs, private houses, and the fresh buildings put up have been temporary merely; barracks for soldiers, offices for temporary employees, and sheds for machinery and so forth. The women refuse to do house work in private families, or if they do take it up they do so on the "living out" plan; so that the dwellers in private houses are fewer owing to the servants' rooms being vacant. And they have to obtain lodgings outside, causing congestion and the demand for more houses to accommodate them. All of these and several other causes might be mentioned as each and all contributing to the scarcity of accommodation, but there are yet others which are perhaps even more poignant.

Before the war for some years contractors were unwilling to risk building houses on speculation, as the laws concerning house property, like every other property, were uncertain. Socialism, of the bastard type, was raising its evil head; anarchy, although only talk for the most part, was rendering all property precarious, and for some five or six years before 1914 few houses were erected, so that for twelve years at least houses were not being built to meet the ordinary conditions of the country's needs.

The labour troubles, as they are called, due to the trade unions' iniquities and absurdities, help to complete the picture of a people gone temporarily mad. Temporarily it is, of course, because the world cannot go on whilst present conditions exist, for men are not going back to slavery, and they will break a way to freedom in future as they have done in the past; and trade unions with their soul-destroying practices and principles will be scotched, destroyed and buried, never to rear their heads again and enthral mankind in their toils. The strangling of thought amongst the so-called labouring classes is but a passing piece of terrorism; they are not to be fooled for ever, and the day is not far distant when they will emerge from their thraldom and seek liberty from their venomous teachers and their slave masters.

In the tropics it is not a question of labour at present, but a disregard of the principles of hygiene and sanitation amongst employers in tropical coun-

tries. The British in the tropics are housed for the most part in a manner which does not do credit to the architects, nor to those who are responsible for the character of the houses they request the architects to build. The bungalow system continues with all its evils. The bungalows apportioned for the Europeans on estates to dwell in are insanitary to a degree. They are makeshift buildings, at best built upon a clearing on unprepared ground and run up rapidly. Wood is the chief material in their construction; the ground beneath the flooring is not covered by cement, concrete, or any damp-proof material. If brick is employed for the lower part damp-proofing between the bricks is conspicuous by its absence. The damp rises in the bricks, as is readily seen by the bricks peeling, becoming covered with fungi, and as they harbour water—a pint to each brick—the dampness in the inside wall causes ailments of many kinds which are wholly preventable. The wood above the bricks rots and decays, and vermin, white ants, &c., infest the buildings from top to foundations. The general health of the dwellers is thus lowered and their powers of resisting disease lessened.

Further, it is necessary to remark also that practically no house is rendered mosquito-proof. A little expenditure would render it so. Mosquito netting is cheap enough surely. The mosquito curtains around the beds is not enough; people do not go to bed when the sun goes down at 6 p.m.; the evening is spent on the verandahs or in the sitting room, and it is then that malaria, yellow fever, filariasis, &c., are acquired. Were the houses, including the doors and verandahs, rendered mosquito-proof, malaria would be lessened and the entrance of mosquitoes defied. That this is the case is not mere idea or theory as was conclusively proved in the Roman Campagna, when in their mosquito-proof house Dr. Low, Dr. Samson, and their staff escaped malaria, whilst those dwelling in unprotected houses suffered from malaria in its most virulent form.

In no part of the tropics are better houses to be seen than in the colony of Hong-kong. Many of the houses are raised from off the ground 4 ft. or 5 ft., and the earth beneath is covered by concrete. Were these houses rendered mosquito-proof, which few are, by netting of windows, verandahs, and doors, malaria could be defied, and quinine taking, which serves to diminish the quality of blood, would be rendered unnecessary. A well-nigh perfectly hygienic house would result were these precautions taken. All agree that this doctrine is sound, and yet it is not practised. The young man going out to the tropics is ushered into a dwelling where these precautions are not taken, and he early succumbs to disease from which there is no reason for his ever acquiring.

In regard to epidemic hospitals in the tropics the steps usually taken are excellent. Just outside the precincts of the town a temporary hospital is rapidly erected of bamboo and dried palm leaves, and the flooring raised some 3 ft. or 4 ft. off the ground. The place selected for the hospital should be uncultivated ground, and one especially where plant life is, if not impossible, at least sparse. By being away from habitations rats and mice are not likely to come, at any rate for some weeks—a most important point when the epidemic is plague. After, say, six or eight weeks a fresh hospital should be erected near by, and the evacuated hospital burnt, so that infection may not be carried by using the old materials in the construction. In colder climates the same rule should be adopted, but it involves an expense which may render this impossible. Blocks of buildings at sufficient distances would allow of transference from another which has been long in use, and the nearest approach to the system in practice in the tropics would be followed.

Man has not devised the perfect dwelling at home or abroad; he has not yet settled upon a standard clothing, and his diet is still being experimented with, each one being a law unto himself. Mankind is yet in its infancy from a hygienic and sanitary point of view, and it will be many a long day before stable rules and regulations are adopted in regard to sanitary matters generally.

Annotations.

Anthrax: Comparison of Surgical and Non-surgical Methods of Treatment. A Review of fifty-one cases treated at the Massachusetts General Hospital from 1888 *to* 1918 (Albert J. Scboll, Jr., M.D., Los Angeles. *Journal of the American Medical Association*, vol. lxxiv, No. 21, May 22, 1920, p. 1441).—In all the patients the diagnosis was made bacteriologically by the demonstration of the anthrax bacilli in the wound. The general symptoms gave no constant indication of the severity of the infection: the mortality in the cases reviewed was 13·7 per cent. Four of nine patients (44 per cent.) treated surgically died; only three (7 per cent.) treated non-surgically died. The patients treated non-surgically were confined to bed. There lesions were left absolutely alone and exposed to the air; no special general measures were carried out. In several of the surgical cases a rapid increase in the œdema, a steady decline in the patient's general condition, and death several hours later definitely pointed to the operation as the causative factor.

On Entamœba Serpentis (A. M. da Cunha and O. da Fonseca, *Memorias do Instituto Oswaldo Cruz, Rio de Janeiro*, 1918, vol. x, fasiculus ii, p. 95).—*Entamœba serpentis* was found by the authors in the intestine of a Brazilian snake which was examined for parasitic protozoa. It is very similar to Hartmann's *E. testudinis*, but no dimorphism is seen in this species. One of the most striking features of this species consists in changes in the nucleus, which are probably to be regarded as cyclic variations of the caryosome.

Experimental Study of Pandemic Influenza (A. M. da Cunha, O. Magalhaes, and O. da Fonseca, *Memorias do Instituto Oswaldo Cruz, Rio de Janeiro*, 1918, vol. x, Fasiculus ii, p. 103).—As the result of experimental investigations the authors consider that influenza is due to a filtrable virus which is present in the sputum and blood during certain stages of the disease. Before or after filtration the virus can provoke reactions on inoculation into different species of animals producing intense and prolonged hyperthermia often after a period of incubation. The heated and phenolized virulent filtrates appear to possess curative properties; autohæmotherapy is often efficacious, and depends on the presence of the virus in the blood. A monkey was immuned by one injection of virus from the sputum, so that it did not respond to a second injection after a suitable delay. The precipitive reaction with the filtrate of the sputum and the serum of the convalescent is often positive whilst the complement fixation reaction with the filtrate is negative.

Granuloma Inguinale in the United States (D. Symmers and A. D. Frost, *Journal of the American Medical Association*).—Although endemic in many tropical countries, granuloma inguinale has not hitherto been recognized as indigenous to the United States. Two cases are here recorded in negroes, aged 29 and 26 respectively, who had never been outside the United States. That the second case can be classified as tropical granuloma inguinale is uncertain, since syphilis and the secondary invasion and phagocytosis of Donovan bodies cannot be denied. It would appear to be established that lesions similar to or identical with those of granuloma inguinale as seen in the tropics associated with morphologically indistinguishable intracellular parasitic inclusions are occasionally found in American lesions—hence the disease in indigenous to the United States.

Current Literature.

THE INDIAN JOURNAL OF MEDICAL RESEARCH. October, 1919.

The Pathogenesis of Deficiency Disease. No. V —Histo-Pathology (R. McCarrison).—In pigeons an exclusive diet of milled and autoclaved rice gives rise to atrophic and congestive changes in all the organs, being particularly severe in the organs least essential to life—namely, the thymus, testicles and spleen. They gravely affect the organs of digestion and assimilation. The kidneys are less affected, and the least affected of all the organs are the thyroid and the glandular part of the pituitary body.

The Pathogenesis of Deficiency disease. No. VI —The Influence of a Scorbutic Diet on the Bladder (R. McCarrison).—Degenerative changes in the bladder epithelium were found in scurvy, thus affording an explanation of the frequent occurrence of hæmaturia in this disease.

The Pathogenesis of Deficiency Disease. No. VII —The Effects of Autoclaved Rice Dietaries on the Gastro-Intestinal Tract of Monkeys (R. McCarrison).—Autoclaved rice dietaries in monkeys cause congestive, necrotic and inflammatory changes in the mucous membrane of the entire gastro-intestinal tract and degenerative changes in its neuro-muscular apparatus. Intense toxic absorption from the diseased bowel takes place, and impairment of its protective power against infecting agents ensues.

The Pathogenesis of Deficiency Disease. No. VIII —The General Effects of Deficient Dietaries on Monkeys (R. McCarrison).—Dietaries deficient in protein, though rich in starch or fat, are potent sources of disease, particularly of the gastro-intestinal tract. An excess of fat, together with deficiency of "B.-vitamine" and protein and superabundance of starch, is particularly harmful, whilst deficiency of vitamines and protein, together with an excess of starch, favour the invasion of the blood and tissues by bacteria.

The Pathogenesis of Deficiency Disease. No. IX —On the Occurrence of recently developed Cancer of the Stomach in a Monkey fed on Food Deficient in Vitamines (R. McCarrison).—Since cancer developed in the stomach of a monkey fed on food deficient in vitamines, the possible influence of vitamine deficiency in favouring the onset of cancer of the stomach should be further investigated.

Report on an Epizootic Disease among Calves at the Amara Dairy Farm (T. H. Gloster and G. Shanks).—Enteritis caused a high mortality among calves at Amara. An aërtrycke-like bacillus was isolated, but it was not decided whether the disease was due to this organism or to a filter passer with the aërtrycke-like bacillus as a secondary infection.

Studies in the Value of the Wassermann Test. No. I—Frequency of a Positive Wassermann Reaction in the Unselected Adult Male Indian Population. No. II—Significance and Value of a Positive Wassermann Reaction in Leprosy (K. R. K. Iyengar).—The Wassermann reaction was found to be positive in 22 per cent. in an unselected and apparently healthy adult male Indian population, showing no differences among the various castes and religions, whilst in 100 cases of leprosy 41 per cent. of positive Wassermann reactions was obtained.

The Prevalence of Ankylostomiasis in the Madras Presidency (K. S. Mhaskar).—Among Tamil coolies in Southern Madras the hookworm infection, though universal, varies in intensity in the various districts and in the various communities, the highest being in the Tanjore District with an average of 91 *N. americanus* and 10 *A. duodenale* per person.

Identification of Three Strains of Trypanosomes from cases of Sleeping Sickness contracted in Portuguese East Africa with Trypanosoma rhodesiense (T. A. Hughes).—Three strains of trypanosomes from cases of trypanosomiasis contracted in the hinterland of Port Amelia, in Portuguese East

Africa, were classified as *Trypanosoma rhodesiense* on account of their general pathogenicity, morphology and atoxyl resistance, and the fact that they came from an area free from *G. palpalis*, but infested with *G. morsitans*.

The Correlation between the Chemical Composition of Anthelmintics and their Therapeutic Values in connection with the Hookworm Inquiry in the Madras Presidency (J. F. Caius and K. S. Mhasker).—Thymol may be looked upon as one of the higher homologues of benzene, phenol, or metacresol.

As a matter of fact its physiological properties are but variations of the properties exhibited by those three substances. It is a powerful antiseptic, acting as a caustic irritant of the mucous membrane and causing excitant effects in the alimentary canal. Its toxic effects are similar to those of phenols, but of a somewhat milder grade. In poisoning from its use, locally there is a burning sensation in the stomach and slightly caustic effects on the mucous membrane of the intestines, producing intestinal irritation and evacuation of fæces, nausea and vomiting. Tremor and convulsions are induced, though rarely, and are less intense than those induced by phenol.

Thymol is a drug of uniform quality, and one that keeps well almost indefinitely.

Thymol is a powerful vermicide, acting both on ankylostoma and necator. Any dose from 30 to 60 gr. administered in one portion will prove effective.

Studies in Ankylostomiasis, No. IV (G. T. Wrench).—Comparing the various methods of examining the stools for ankylostoma ova, the following was found to be the most efficacious:—

Particles of fæces are scooped up from five different parts of the stool with bazaar-made scoops. This fæces is placed in a test-tube and shaken up with equal parts of methylated ether and hydrochloric acid (33 per cent.), the emulsion strained through fine muslin and centrifuged. The fat and debris are carried or "levitated" to the top, the ova with heavier debris are deposited below in a fine emulsion. This emulsion is sucked up by a pipette, and as much as possible placed on the upper surface of a coverslip resting on a slide, three coverslips being made by cutting an ordinary slide into three equal parts. Five minutes or more are allowed for settlement. The excess fluid is then pipetted off and the coverslip examined. If the emulsion is too thick for vision, it may be diluted and mixed with more of the ether and hydrochloric acid mixture, and, after a further five minutes for settlement, the excess again pipetted off.

The Tinturometer, an Instrument for Measuring Tint and Turbidity (W. F. Harvey).—An instrument consisting of a cylindrical measure glass and a steel foot rule has been devised for measuring the tint and turbidity of fluids. It has been used to measure (1) the degree of growth of organisms in fluid media of different composition, (2) the concentration of erythrocytes in the blood, and (3) the hæmoglobin content of the blood.

Measurement of Bacterial Content in Fluid Suspension (W. F. Harvey).—Measuring the bacterial content and rate of growth of organisms in fluid and culture media by means of the tinturometer, it was found that growth was influenced by the presence of (*a*) fermentable sugar, (*b*) peptone, (*c*) meat extract.

The Determination of Incubation Periods from Maritime Statistics with Particular Reference to the Incubation Period of Influenza (A. G. McKendrick and J. Morison).—The mean incubation period of influenza was found to be 32·7 hours, whilst the initial period of non-infectivity must be of short duration.

Evidence regarding the Immunity conferred by an Attack of Influenza with a Study of Three Local Epidemics; with Mathematical Note by Major A. G. McKendrick, I.M.S., R. H. Malone).—An analysis of the figures obtained in all three epidemics adduces strong evidence that immunity is conferred by one attack of influenza.

Pasteurellosis in Rabbits following the Intravenous Injection of Influenza Bacilli (R. H. Malone).—Pasteurella organisms were obtained from rabbits which had died after intravenous inoculation of influenza bacilli for the preparation of high titre agglutinating sera. Similar organisms were obtained from the nasal secretion of rabbits showing no signs of illness which had been in contact with the animals which had died of the Pasteurella infections.

Abstracts.

THE EXPERIMENTAL DETERMINATION OF THE VERTEBRATE HOSTS OF SOME SOUTH AFRICAN CERCARIÆ FROM THE MOLLUSCS, *PHYSOPSIS AFRICANA* AND *LIMNÆA NATALENSIS*.[1]

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Schistosomes.

Schistosoma hæmatobium and *S. mansoni* have both been studied. The former fluke is the more common. *S. hæmatobium* is present in larval form in *Physopsis africana*, and I have found it also in a very small number of specimens of *Limnæa natalensis* (4 out of 620). The former snail is to be regarded as the common intermediate host of *S. hæmatobium*, as was first determined by Dr. J. G. Becker, by the inoculation method. The cercariæ of *S. mansoni* have been found by me in three specimens of *P. africana* only.

[1] Abstracted from the *Medical Journal of South Africa*, vol. xv, No. 6, Johannesburg, January, 1920.

The life-history of *S. hæmatobium* briefly is as follows: The eggs of the worm pass from the human body with the urine and may reach water, preferably stagnant or very slow moving. A ciliated larva, the miracidium, hatches from the egg and swims about actively. Should the miracidium not meet a pond snail, usually *P. africana* (in South Africa) within six to eight hours after hatching, it dies. By experiment I have been able to determine a certain amount of attraction of *P. africana* for the miracidia of *S. hæmatobium*, but I have not observed any attraction between the miracidia and the mollusc before the organisms have been in the same dish of water for at least forty-five minutes. Attraction between the miracidia of *S. hæmatobium* and *L. natalensis* has only been observed to a very slight extent. If the miracidium reaches a physopsis it penetrates the pulmonary cavity of the snail, settles down there, and develops into a hollow structure termed a sporocyst; active multiplication occurs, and it gives rise to a number of active, forked-tailed larvæ, the cercariæ, which spread throughout the liver and generative organs of the snail, which they eventually destroy. The body of the cercaria of *S. hæmatobium* is about 240 μ long by 100 μ broad, its tail is about 200 μ by 45 μ broad, while the forks of the tail are 80 μ to 100 μ long. The head shows a small oral sucker, and a small acetabulum or ventral sucker, the latter being often less obvious than the former, as three pairs of mucin glands partly obscure it. There are three pairs of hollow piercing spines at the openings of the ducts of the mucin glands at the outer margin of the anterior or oral sucker. A group of several large germ cells lies behind the posterior sucker. Numerous cercariæ are present in a heavily infected snail—I have obtained over 1,500 active cercariæ from one *P. africana*. These cercariæ leave the snail ultimately, and are capable of piercing the skin of a vertebrate such as man, whence they find their way to the liver of the host, where they grow into adult worms. After copulation, the female deposits her eggs in the walls of the bladder, whence they ultimately pass out with the urine.

Modes of Infection.—These have been shown experimentally by me as follows:—

(1) A white rat, A, was exposed for one hour to water containing schistosome cercariæ from *P. africana*. A control rat was exposed for the same time to ordinary tap water. The rat merely paddled about in the water for the given time. In the case of the experimental rat, it commenced to nibble at its paws three minutes after it was placed in the water, and the skin of its paws and feet became reddened. The control showed no sign of discomfort. Later, the fur of the experimental rat was staring, particularly as the malady progressed, the fur fell out, the eyes became cloudy, there was great emaciation and incontinency, and finally death occurred. Over forty *S. hæmatobium*, both male and female, were recovered from the liver of this rat. Sixty-four days elapsed from the time of its exposure to the schistosome cercariæ to the time of its death.

(2) A white rat, B, was fed with bread soaked in a little water containing a few schistosome cercariæ. The experiment was so arranged, that no part of the rat other than the mouth came in contact with the infective material. The animal ate the bread greedily, but as soon as it was allowed to do so it commenced to scratch its mouth and palate. A control rat similarly treated, but fed on bread only, gave no such indication of distress. The symptoms during the course of infection were like those of rat A, and the animal died ninety-five days after the infective feed. *S. hæmatobium* was recovered from its liver as in the case of the first rat.

(3) A white rat, C, was exposed to infection by paddling in water containing schistosome cercariæ from *L. natalensis*, but in very small numbers, on two occasions of an hour's duration each. It died seventy-nine days after the first exposure, and seventy-six days after the second. The illness ran a similar course to those of the former rats, and adult *S. hæmatobium* were recovered at the autopsy from the liver and mesenteric veins.

Two guinea-pigs similarly exposed or fed gave similar results, but the foregoing examples are given as typical of the series.

Thus *P. africana* and *Limnæa* have been proved experimentally to be the hosts of *S. hæmatobium*, and the former snail to be one host of *S. mansoni*, though it may not be the common host.

Distomes.

Distome cercariæ have been observed in both *P. africana* and *L. natalensis*, both of which molluscs can harbour the parasites of bilharziasis. The determination of the adult form and of the final hosts of these cercariæ is therefore necessary. The present results have been obtained by feeding certain vertebrates with cercariæ parasitic in *L. natalensis*, and believed to be identical with those named *Cercaria pigmentosa* by Dr. Cawston in 1919. These cercariæ encyst on vegetation. They are thus described and defined by Cawston (1919) when writing on "Encysted Cercariæ": "The other encysting cercaria possesses a terminal, oral and a median ventral sucker. No eye spots could be detected. The head of the cercaria is heavily pigmented, as are also the rediæ in which these cercariæ are produced. These rediæ are three-eighths of an inch in length and whiten the liver substance of infected snails. The cercaria itself is fully a millimetre in total length. The rediæ possess a well-defined oral sucker and gut distended with particles of food. Towards the posterior end of the rediæ on the left side is a poorly-developed locomotor appendage." Cawston named the cercariæ "*C. pigmentosa* in view of their pigmented heads."

A brief outline of the Trematode, as I have observed it, can be presented here, but fuller details will appear later.

The livers of the *L. natalensis* infested with this

parasite appear streaked with white threads, which sometimes show orange to black markings. These threads are the rediæ, the intestines of which contain orange to black contents. The rediæ vary in size according to the season and to the particular time of reproductive activity of the fluke in the snail. The largest specimens that I have observed were about 12 mm. long, this size being quite exceptional in my experience. Some few were from 6 mm. to 7 mm., but the majority were 1·5 mm. to 2 mm. in length. The rediæ produce cercariæ, and daughter rediæ appear to be formed only towards the end of the multiplicative activity of the parent redia.

The cercariæ are active organisms and vary in appearance according to their degree of activity. Thus, the body of a cercaria measures about 500 μ when extended fully, while when contracted it appears rounder and may measure only 250 μ. The length of the tail varies from 159 μ to 200 μ. The anterior sucker is fairly prominent and the posterior one easily seen. The intestine is typically distome. In life, the body is crowded with masses of cystogenous granules (" pigment " of Cawston) which largely obscure the finer details of the organization. These granules are soluble in alcohol, chloroform and formalin, so are not well seen in preserved material.

When an infected snail is isolated in water, the cercariæ readily leave it and can be seen with the naked eye swimming actively in the surrounding water. After a time they leave the water and creep up the stems of any water plant in their vicinity, or failing water plants or grass, they creep on to the shell of the snail itself. Each cercaria commences to extrude the cystogenous granules from its body and soon casts its tail. The body then contracts into a spherical mass surrounded by a black cloud of granules. These gradually condense and form a thick cyst wall which hardens on exposure and contracts somewhat. The encysted cercaria shows its two suckers, forked gut and the remains of the cystogenous granules. I have obtained 1,070 perfect cysts from one *L. natalensis*, and several hundred from one snail are common. The encysted cercariæ on herbage by the waterside are in favourable situations for ingestion by any herbivorous animal, such as ox, sheep or buffalo.

By direct experiments of feeding herbivorous animals (sheep, rabbits and guinea-pigs) and omnivorous animals (rats, mice) on green barley and cabbage contaminated with cysts of *C. pigmentosa*, I have succeeded in obtaining adult flukes, which correspond with the adult trematode known as *Fasciola gigantica*, Cobbold, reported from oxen, buffaloes, sheep, goats, giraffes, and in one instance from man. Brief notes on certain typical experiments are given.

A rabbit was fed with green food contaminated with cysts from *L. natalensis*. After some time it showed signs of emaciation. It died sixty-four days after the infective feed, and over twenty adult flukes were obtained from its liver at post mortem. The liver was enlarged; it was greyish with white patches, which proved to be flukes, some of which emerged from the disintegrating capsule and moved about actively. Recent hæmorrhages into the connective tissue round the terminal part of the rectum and the superficial fascia of the lower part of the abdomen and the posterior aspect of the thighs, and a large hæmorrhagic sac between the superficial and deep muscles of the thigh were present. These hæmorrhages contained one or more flukes.

Similar results were obtained with a guinea-pig, which died 74 days after the infective feed. The morphology of the flukes obtained was the same as those of the rabbit.

A young sheep, bred from and belonging to a stock known to be free from " liver fluke," was fed with green barley contaminated with cysts from *L. natalensis*, two such feeds being given. On the first occasion only a few cysts were available, but on the second occasion, twenty-four days after the first, about 250 cysts were administered. The animal died 143 days after the first and 119 days after the second infective feed, and 223 adult flukes were recovered from it at autopsy.

Examination of the fæces of the sheep was made daily, but trematode eggs were not detected. Sixty-four days after the second infective feed the animal was noticed to be less active and to lie down a great deal, but the weather was hot and it was thought that this might account for its laziness. However, this attitude continued at intervals until its death. The animal refused most of its food for seven days before it died. Diarrhœa occurred during the last three days.

At post mortem the body was well nourished and was fat. The liver showed marked perihepatitis, was greenish in colour, with numerous small blackish areas that proved to be hæmorrhages. There was slight œdema. The bile ducts were greatly thickened and fibrotic. The kidneys were normal, except that they were small and pale, and one fluke was recovered from the pelvis of the right kidney. The intestines were heavily bile-stained and flukes were present in the canal, which also showed numerous small hæmorrhages and contained free blood. All the blood-vessels of the mesentery were engorged. A small hæmorrhage beneath the skin near the anus contained one fluke. The other organs of the body were normal.

The organ most affected was the liver, from which 189 flukes were removed. The bile ducts were blocked in parts and two and three flukes entangled together were found in these places.

The adult flukes varied in size, large ones being 45 mm. long and about 7 mm. broad, while small specimens were about 20 mm. long. Sexually immature forms were also present, varying in length from 5 mm. to 19 mm. and in breadth from 2 mm. to 4 mm. The sides of the body were nearly parallel, but there was a short cephalic cone. The anterior sucker was distinct, about 1 mm. in diameter, the posterior sucker was prominent and in large specimens reached 1·8 mm. in diameter. The

pharynx was well marked, the œsophagus short, and the lateral, branching, intestinal cæca were directed slightly backwards.

The reproductive system is typical of Fasciola. There are two testes, placed one behind the other and much branched. Each has a vas deferens and the vasa deferentia unite anteriorly. The ovary is relatively small and is branched. The uterus and oviduct are convoluted. Yolk glands are present and are greatly branched. The vitelline ducts are readily seen, especially the transverse junction, which is dilated centrally into a vitelline receptacle. A large shell gland is present.

The eggs are large, measuring about 175 μ long and 85 μ broad.

The fluke is identified with *F. gigantica*, Cobbold, known as a parasite of oxen, buffaloes, sheep, goats, giraffes, hares and rabbits in Africa. Its life-cycle and intermediate host are now determined for the first time.

F. gigantica is likely to be found to be much more common in sheep and cattle in South Africa than might at first be supposed. Its natural occurrence in the Transvaal is already known to the Veterinary Research Division.

Echinostomes.

Both *P. africana* and *L. natalensis* harbour the young forms of Echinostome flukes. I have found the larval forms of three hitherto unrecorded forms of echinostomes in the above mentioned molluscs, *P. africana* being more frequently parasitized. As a rule the mollusc harboured one kind of fluke only, but in a very few cases all three larval flukes were present. The parthenita (rediæ) agree in being orange coloured, and the livers of infected snails appear orange masses. The life-cycle of one of these Echinostome flukes is here briefly outlined.

The rediæ vary greatly in size, many being about 1·5 mm. long, though occasionally specimens 3 mm. long have been found. They are actively motile and possess one or two pairs of locomotor appendages. The rediæ contain bright orange chromatophores and their body fluid is pale orange in colour. They have a large simple intestine, frequently with almost black contents, and usually distended. Within the redia there are usually several morulæ and cercariæ. Daughter rediæ may also be present. These are small and are about 0·5 mm. long when they emerge from the parents.

The cercariæ are relatively large, varying in length according to the degree of extension or contraction. Many have a body about 450 μ long, with a simple tail about 350μ long and body width of about 150μ. The anterior end of the body is somewhat flattened, the oral sucker is rather large, and the "head" has the characteristic spined armature of Echinostomes. It consists of two alternating rows of simple spines with a group of four spines at each lateral extremity of the head. The acetabulum is prominent. The pharynx is small and rounded, the œsophagus long and narrow, passing backwards to the anterior genital mass and then forking into the two cæca constituting the intestine. The cæca end almost at the base of the body on either side of the bladder. Two germinal rudiments are present, one well-marked mass, almost in the median line, embracing the caudal edge of the acetabulum, composed of many small cells, and one smaller mass at the anterior end of the acetabulum, partly occupying the space between the forks of the intestine. The excretory system consists of a more or less polygonal, laterally compressed bladder, from which two sinuous collecting tubules arise anterolaterally and pass forwards, diverging somewhat outwards about one-third of the distance between the anterior and posterior suckers. The body is crowded with masses of cystogenous granules which render observation of minute internal details very difficult. The cercariæ are easily visible to the naked eye, and are very active when they swarm out of the snail.

The next phase of the organism is passed in the "clawed toad or frog," *Xenopus lævis*, as I have determined experimentally. Thus:—

A frog, *X. lævis*, was put in water containing the *Echinostome cercariæ* from *P. africana* and *L. natalensis*. The cercariæ quickly swam round and attached themselves to the frog by their suckers, choosing first the area around the eyes and then the glandular areas that represent the remains of the lateral line system in Xenopus. The cercariæ pierce the skin, cast their tails, extrude their cystogenous granules and form round cysts beneath the skin of the frog. Within each cyst the cercariæ becomes curved, gradually contracts and changes its shape, curving itself. The newly-formed cysts are from 120μ to 175μ in diameter. In some cases, not only the skin and the subcutaneous tissue, but also the surface of the muscles showed numerous small nodules at post mortem due to the cysts of the Echinostome. The presence of the parasite has harmful effects on the host, and the illness usually has a fatal termination in Xenopus.

In the case of the Xenopus referred to previously, it was placed in water containing the *E. cercariæ*, its control being placed in ordinary tap water. It soon showed signs of irritation, rubbing its eyes frequently, and by the use of a hand lens the cercariæ could be seen attached to the skin. After a short time the blood-vessels of the eyes became greatly inflamed and the circum-ocular ring of skin became markedly œdematous and showed granulations, the nodules projecting outwards and also into the subcutaneous tissue. About fifty days after the experiment began, the whole body of the frog became very œdematous, the eyes becoming entirely concealed by the overhanging œdematous skin of the head. Scratching occurred, and on the sixtieth day a small piece of skin was scratched out, the fluid beneath the skin poured forth, the skin collapsed and the Xenopus became relatively normal in appearance except for some wrinkling. Some encysted Echinostomes and some freshly emerged from the cysts were present in the fluid exuded. On the sixty-fifth day the Xenopus died. For some days prior to the draining away of the

œdematous fluid, small freely moving Echinostomes, about 540 μ long and 180 μ broad, were found crawling on the skin of the frog, having burst from their cysts. The process of emergence from the cyst has been often observed. The small flukes obtained from the surface of the skin and those still encysted show similar structures, and the same head armature is present as in the cercariæ from which they were developed.

A second Xenopus was exposed to infected water in the same way as the first one. The infection ran the same course, but the frog, which was younger, died eighteen days after the exposure. Other Xenopus exposed to infection are still alive, but look unwholesome and show cysts beneath the skin. It may be mentioned that the frogs seem to suffer little or no inconvenience if the cysts are removed from their skin from time to time, so that the transition from the cercariæ to the adult form can be fairly readily traced.

Fully sexually mature Echinostomes have not been observed as yet, though flukes with the genitalia in a much greater stage of development than those of the cercariæ have been observed. I suggest the provisional name of *E. xenopi* for this organism, as it appears to have been unrecorded hitherto, the life-cycle and morphology being as outlined.

Monostomes.

Another amphibian fluke, but a Monostome, has been obtained by exposing *X. lævis* to water infected with cercariæ from *P. africana*. The larval stages of the fluke are rare parasites of the mollusc, and I have need of much more material before final results can be given. The redia is simple, about 1·5 mm. long, possessing no marked locomotor appendages, but a muscular contractile body. The pharynx is oval and the intestine a simple sac. The cercariæ appear to mature one at a time. Each cercaria possesses an oral sucker, but no acetabulum. There is no excretory bladder at the posterior end of the body and two excretory tubules pass forwards uniting near the sucker. The oral sucker is small, the œsophagus is very narrow, while the cæcal forks of the intestine are close together at first but diverge somewhat further on. The whole body is full of unicellular cystogenous glands which obscure details of the body structure.

When the cercariæ leave the snail they swim freely in the water, lashing their rather powerful simple tails. When *X. lævis* is placed in water containing the cercariæ, they pierce the skin, selecting first the ring of skin round the eyes and then the glandulose areas along the lateral lines, just as the Echinostome larvæ do. Encystment rapidly occurs, the tail is cast off, the cystogenous granules are shed and harden to form a compact cyst wall. The cyst is larger than that of the Echinostome, often reaching 0·5 mm. in diameter.

The effects of the host resemble those produced by the Echinostome previously mentioned, the œdematous circum-ocular ring being very noticeable. Rupture of the cyst also occurs, and the actively moving Monostome, as yet sexually immature, reaches the surface of the skin in some cases. The further development of the Monostome has not yet been fully established, but work on both it and the Echinostome is in progress.

Summary.

S. hæmatobium and *S. mansoni*, the respective excitants of urinary and intestinal bilharziasis, have been found in larval form in the South African molluscs, *P. africana* and *L. natalensis*. The infection of the molluscs with *S. mansoni* is uncommon. The presence of *S. hæmatobium* is much more frequent in *P. africana* than in *L. natalensis*. Adult Schistosomes have been obtained in laboratory animals by submitting them to such natural modes of infection as bathing or exposing them to water containing the cercariæ, and by causing them to drink water so contaminated.

L. natalensis harbours the larval forms of *F. gigantica*, the large, narrow liver fluke producing liver rot in oxen, sheep, buffaloes and goats. Full-grown, sexually mature, adult flukes have been obtained by feeding sheep, rabbits and other laboratory animals with food contaminated with the encysted cercariæ (apparently *C. pigmentosa*), obtained from the pond snails.

Both *P. africana* and *L. natalensis* harbour the larval stages of an Echinostome fluke, which undergo encystment and subsequent development in the "clawed frog," *X. lævis*. The life-history of the Echinostome is established, and it is provisionally named *E. xenopi*.

A Monostome fluke has also been produced in *X. lævis* by exposing it to water containing cercariæ from *P. africana*.

Thus, it has been experimentally determined that in the two South African snails transmitting human bilharziasis, in addition to the Schistosomes, an important cattle Distome, an Amphibian Echinostome and an Amphibian Monostome are present.

STATISTICAL REMARKS ON THE TREATMENT OF BILHARZIASIS BY TARTAR EMETIC.[1]

By Henri Garin, M.D.,
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Of the 4 per cent. tartar emetic solution, we gave the first day 1 c.c. (0·6 gr.), and afterwards 3 and 4 c.c., up to 5 c.c. (3·1 gr.) to strong patients. For small children we fixed the doses according to age.

The treatment gave no trouble or complications, if we except the fit of coughing and sometimes vomiting which began directly after the injection and lasted from a few minutes to half an hour. On three patients we tried quotidian injections, but this caused continuous nausea and vomiting after every meal, and the effect on the disease did not seem to be more

[1] The *Medical Journal of South Africa*, vol. xv, No. 8, Johannesburg, March, 1920, p. 179.

rapid, so we stopped this way of administration. A consequence of little importance was the appearance of a papular and very itchy rash, starting at the site of the injections, and probably due to minute doses of the fluid remaining on the outside of the needle which had been used to draw up the medicine, and sufficient to irritate the skin, without bringing on inflammation or gangrene, such as bigger quantities may do when injected outside the vein. This trouble stopped when we used two different needles for aspiration and injection.

The urine of every patient was examined before beginning the treatment, and again after every two or three injections. Ten c.c. were centrifuged for five minutes, the sediment spread on a slide and the whole of it examined field by field before stating that no eggs, or only degenerate ones, were present.

After a few injections the majority of eggs appeared dead or degenerated, the shell deformed and thinner, the embryo transformed into a granular body, getting smaller and disappearing altogether, leaving only empty shells.

One hundred and twenty-two patients suffering from vesical and two from rectal bilharziasis were treated. All of them had living eggs at the first examination. Twenty-one never came back after the first injection. Twelve came only twice, but their urine, as also the urine of nine patients who received three, four or five injections were not examined again for diverse reasons.

The subjective effect of treatment is even more marked; after a few injections the patients declare that they feel much better and do not suffer any more pains and burning sensation during micturition, although blood and degenerate eggs are still being passed. The contrast between the subjective amelioration and the small amount of change in the quantity of blood and the number of eggs passed (although all degenerate or dead) is sometimes very striking. Two patients continued to pass a notable quantity of blood for weeks after careful examination of several samples of urine did not show any eggs, but they felt absolutely well. Without cystoscopic examination it is difficult to know what anatomical change in the bladder was responsible for that fact. In two other cases exceptionally, the patients continued to complain of pain and burning feeling at the end of the micturition, for months after the urine was quite clear, and showed no blood nor eggs. Of the two rectal cases, one was cured after five injections, no blood and no eggs being found, and the other still showed living eggs after two injections, when he stopped the treatment.

If we look at the results from another point of view, and count the days after the beginning of treatment until no more living eggs could be detected, we find that until the eleventh day the cures are very few, only four out of twenty-nine patients, who all received only four injections or less, one only getting five: one was cured on the third day (after three quotidian injections), one on the fourth day (after two injections), one on the eighth (after two injections), and one on the eleventh (after four injections).

After the eleventh day, living eggs were the exception, even in patients who had received only a few injections. Among fifty-one patients, only three showed them: one on the fourteenth day (after five injections), one on the sixteenth day (after three injections), and one on the thirty-fourth day (after two injections only). Of the forty-one cured, 50 per cent. had received five injections or less (twelve had got five, eight had had four, two had had three, and two respectively two and one only). This last case was examined one month after his first and only injection, and in several samples of urine we were unable to detect a single egg. But we are not prepared to give the credit of this disappearance to the treatment, and think rather that it was due to some coincidence or external cause.

After comparing these various figures, it seems possible to fix a routine treatment for busy dispensaries, giving six injections in twelve days, with a total dose of 0·9 grm. (or about 14 gr.) of tartar emetic, and examining the urine after these injections only, to detect the few patients requiring further treatment.

Reviews.

ESSENTIALS OF TROPICAL MEDICINE. By Walter E. Masters, M.D.Brux. London: Bale, Sons and Danielsson, Ltd. 1920. Price 42s. net.

This work is intended to be a vade-mecum for the student and busy tropical practitioner. It does not claim to contain anything new, or to substitute any other work. It is a well arranged digest of our knowledge of tropical medicine in all its branches, including skin diseases, eye diseases, venoms, tropical sanitation and hygiene and laboratory hints, in a form handy for ready reference. There is a useful appendix on fallacies in blood examination, on the general treatment of fevers, on embalming, and hints in tropical surgery, &c. There is also a full and complete index.

DIATHERMY IN MEDICAL AND SURGICAL PRACTICE By Claude Saberton, M.D. London: Cassel and Co. 1920. Pp. vi + 138. Price 7s. 6d. net.

The aim of this little book is to serve as a guide to students and practitioners who wish to master the technique of diathermy, and to appraise its place in the treatment of disease, and has been extremely well carried out. We thoroughly endorse the author's statement that this therapeutic method should not be given by unqualified operators, and that no kind of electrical treatment, indeed, should be administered by the untrained. If dangers are to be avoided and beneficial results obtained, the employment of these agents should certainly be limited to those who have a working knowledge of their effects in diseased conditions. We warmly commend this little book to all those interested in the subject.

Original Communications.

SOME NOTES ON FIFTEEN YEARS' EXPERIENCE OF MALARIA IN THE UPPER CONGO.

By Arthur Pearson, M.B., B.S.Lond., M.R.C.S., L.R.C.P.
Katanga, Belgian Congo.

At the commencement I would emphasize the fact that, while I feel justified in being dogmatic in regard to malaria as it is met with in the Katanga District of the Belgian Congo, I do not believe that my findings and my methods would necessarily apply with the same force to malaria in other parts of the world. Indeed, I believe that much confusion has resulted in the past from attempts made by individuals to apply their own limited experience of malaria in laying down the law upon the whole subject. In illustration of this point I may note that whilst the malignant tertian parasite of the Katanga is morphologically indistinguishable from that of the Lower Congo, of German East Africa and of Sierra Leone, wide symptomatic differences have shown in my cases of infection from those places.

Thus, a Katanga infection is a relatively benign affair, in which grave pernicious symptoms, such as malarial coma, were rarely to be noted. The chief danger in the local infections lay in the predisposition to blackwater fever under those circumstances which experience has shown to be favourable to the onset of this dangerous development. Cerebral coma here has generally been noted among the very few cases coming under observation after infection in the Lower Congo or at Sierra Leone. Cases from German East Africa have also been few in number, and have shown greater resistance to treatment than is met with in most cases of local infection. This resistance has, however, been shown in the same way, i.e., by persistent relapse each month rather than by resistance to treatment during the attack.

Again, it is a very frequent experience to find that individuals who have lived for years in one malarial district without adopting any effective measures of prophylaxis and yet without suffering much from fever, may find themselves as susceptible to malaria in a new district as any newcomer from England. This point is generally exemplified in the Katanga by arrivals from Southern Rhodesia, whose experience in malarial districts in that country prompts them to neglect the precautions recommended here. Disaster nearly always follows within a month or so.

Prophylaxis.

Mosquito destruction is, of course, the best prophylaxis. Very often indeed, however, it is not practicable. There is no need for me to take up space in discussing it, beyond noting that however apparently hopeless it may seem to attempt it, a genuine effort will always meet with a certain degree of success. Too often in the tropics no attempt is made because local conditions render complete success impossible without excessive expenditure.

Protection from Mosquitoes.—Protection of houses by netting and of individuals by mosquito nets. This enormously important subject needs no discussion in these notes. Again, however, it is for the most part neglected by most individuals, or the rules with regard to it are supplied with a slovenliness which renders them useless.

Quinine Prophylaxis.—When I left England for the Congo in 1903 I held fresh in my memory one sentence from a lecture by the late Dr. Crosse, who had had nine years' experience with the Niger Company:—

"If you get your men to take 5 gr. of quinine each day they will never get blackwater."

Until two years ago I have been actively engaged in practice. About 75 per cent. of the Europeans under my care suffered from malaria in varying degree each year, and about 25 per cent. of all cases attended have been due to this cause. Dr. Crosse's dictum still holds good. I have not yet met with a single case of blackwater fever in a man who claims to have taken his 5 gr. of quinine each day. Those who have taken their 5 gr. with unfailing regularity are probably few in number. Those who have meant to do so, and have forgotten occasionally, are probably many, and are among those who claim to observe the rule.

Taking these two classes together, one finds a considerable number (I include myself, my wife, and a number of personal friends of whose habits in this respect I am sure) who never suffer from fever. Nearly the whole of the remainder enjoy good health and suffer from fever not more than once or twice in the year, the form then being very light, of short duration and of uncertain diagnosis, parasites being but rarely demonstrable.

The dangers of which one reads here and there consequent upon this daily dosage of 5 gr. of quinine do not exist. I have not seen dyspepsia, loss of memory, or deafness follow in a single instance; once only have I seen urticaria. In one or two cases I have seen pre-existing deafness become slowly more pronounced in the patient's opinion, although the difference was not evident to me. Quinine amblyopia I have never seen with these doses. There are those who think quinine at night induces insomnia; such can take their dose at breakfast. Others complain of small disagreements at first, such as shaking hands and nervousness, but these soon get habituated to it if they commence with half a dose night and morning.

The case of urticaria was one in which the skin trouble followed the taking of even 1 gr. I advised this patient to leave the country. He did not do so until after an attack of blackwater in the following year.

Among those who have not adopted the daily dose, malaria and anæmia have given rise to many ills, and the considerable dosage of quinine neces-

sitated has been very irksome to those already partially deaf.

When I had been three years in the Congo I began to receive inquiries from neighbouring districts as to why the pioneers of the Tanganyika Concessions, then under my charge, did not get blackwater fever. Over three years of pioneering in such a country without a death must be something of a record. I wrote on the subject at that time to the *British Medical Journal*, but still have my letter—which I held back—believing that my experience had been too small. What I wrote still holds, however, and I believe there is not a medical man within 500 miles who does not agree that daily prophylactic quinine makes all the difference here between good health and bad. Certain of those who follow the rule will still get occasional malaria. It is of course necessary for them to adopt curative doses for a time on such occasions before returning to their daily dose.

Treatment.

In 1903 I commenced quinine administration on the lines recommended by Sir Patrick Manson, i.e., I gave 30 gr. daily by the mouth, in 5-gr. doses, spaced through the day. I gave intra-muscular injections in those cases only where vomiting was a symptom which interfered with quinine by the mouth. After a year or so I commenced to experiment with smaller doses. I found I got equally good results with 25 gr. a day. I reduced to 20 gr. a day and found it good. I reduced to 15 gr. a day, and found that, whereas many cases seemed to do well with this dosage, there was an appreciable number in which the response was more slowly arrived at. At the same time I found that the convenience and certainty associated with the intra-muscular method made it of great value, and I made progressively greater use of it as years passed. I found that a daily injection of 15 gr. for three days was sufficient in practically every case, a fourth daily injection being required so seldom as to be almost countable in my memory of cases to-day. Within five years I had fallen into a routine treatment as follows:—

(1) By the mouth: Four doses of 5 gr. of bisulphate of quinine, spaced at four-hourly intervals during the day; 20 gr. per day. This to be continued until three consecutive days have passed without fever. The dose then to be dropped to 15 gr. a day in three doses of 5 gr. each. Then 10 gr. a day in two 5-grain doses for a week.

(2) By injection: Three daily injections of 15 gr. of quinine (bihydrochloride) deeply into the muscles. One injection each day. Thereafter, in the rare event of a continuance of pyrexia, a fourth injection on the fourth day. Thereafter, quinine by the mouth, 15 gr. daily for three days, and then 10 gr. daily for a week. In both cases the 5-gr. daily dose is then enforced.

On certain points in connection with these methods of treatment here I can be definite:—

(*a*) The best quinine must be used. I have always used Burroughs and Wellcome's. If this be employed, it is as useful and certain to give quinine tabloids by the mouth as in solution Anyone can see this for himself who will drop one of Burroughs and Wellcome's bisulphide of quinine tabloids into water and watch it break up and disappear within two minutes.

(*b*) The smallest efficient dose should be used. When one sees four times the efficient dose given, as I have at times seen it in this country, one realizes how the popular prejudice against quinine is brought into being. Unnecessary headaches, deafness and gastric irritation must certainly often result from the administration of quinine in unnecessary quantity.

(*c*) Intra-muscular injections can be given with safety. I have never seen an ill-effect from my own administration by this method. I have only once seen ill-effects when injections have been given by a local colleague; in this case sloughing resulted from a subcutaneous injection.

I give it in concentrated form and inject very slowly. The 15 gr. is dissolved in 30 minims of freshly boiled water. The solution is then reboiled. Injection is made while this solution is still warm with a syringe which, with its needle, has been boiled on the spot in water. Tincture of iodine is used for the skin. The needle is plunged in at right angles to the skin to a depth of 3 centimetres. I cannot believe from my own experience, which covers an enormous number of such injections, that any harm can result from quinine injections made in this way if proper precautions are taken.

Injection may be made in several places. I have used the insertion of the deltoid; the inter-scapular site and the upper and outer quadrant of the gluteal region. The last is best, and I have used it almost exclusively for the last ten years. Finally, for patients who are bedridden for a time, as when a typhoid patient shows malaria, I have injected into the muscles of the flank, slanting-wise. This has been quite a good situation. Nearly always the injection is followed by some pain and slight induration. This passes off in three days, and does not compare with the pain and induration following injections of grey oil. The pain from the quinine injection commences at once, and is passing off at the period when pain from grey oil injection is commencing.

Exceptionally, but not very rarely, quinine injections give no pain whatever.

(*d*) It will be seen that, so far as my experience in Katanga goes, 20 gr. of quinine by the mouth give the same results as 15 gr. by intra-muscular injections. Treatment by either of the two methods along the lines which I have indicated have never failed here to bring to normal within four days a temperature which has been raised on account of malaria. A pyrexia here which is not brought to normal in this way within this period is not due to malaria. The chief advantage of injection is that one knows the patient gets it. I have imagined also that absorption from quinine injected into the

muscle is slower and more regular than in the case of quinine by the mouth. For this reason I have preferred to use the injection method when the general condition of the patient and his blood threatens blackwater fever, or when quinine is given during blackwater.

Under these circumstances I have believed that I have found it useful to give sodium bicarbonate in large doses by the mouth for twenty-four hours before giving quinine, and have commenced when I have given quinine during blackwater with injections of 5 gr. only—twice daily. I have never seen increased hæmoglobinuria result from this.

(*e*) Blackwater fever may undoubtedly follow upon quinine administration if this is upon the wrong lines. I have seen this many times. Given an individual who objects to quinine and takes it only occasionally during days of fever and never as a prophylactic. Such an individual gets much preyed upon by malarial parasites which generally demonstrate the fact to the patient by repeated attacks of fever, but may, in individuals with strong natural resistance, bring about a considerable degree of anæmia without inducing actual pyrexia. Time passes, and the condition of such a person grows progressively worse until he is in a stage of predisposition, which only requires an exciting agent to precipitate a hæmolysis. Then, one day, with an attack of fever, he takes 15 or 25 gr. of quinine in a single dose; six to eight hours afterwards blackwater shows. I have seen this many times.

Let me repeat that I have never seen it in a man who took his 5 gr. of quinine daily. Thus, quinine is the best prophylactic against blackwater fever, and yet may produce it, an apparently paradoxical state of affairs which leads to much confusion in the lay mind.

I have only twice seen it follow a less dose than 15 gr. On one occasion it was a dose of 10 gr. in a man who usually took 10 gr. three times a week. The other occasion was after a dose of 5 gr. with a man who had frequently preached his objections to any quinine, and had probably had none for six months previously. Both occasions referred to men who had just sustained extraordinary fatigue.

(*f*) The maximum dose at any time by the mouth should be 5 gr.

(*g*) Quinine resistant parasites I have not met in the Katanga in the sense that an actual febrile attack persists in spite of the administration of quinine. Parasites do, however, manifest resistance in a few patients by showing early relapse in spite of this treatment. Two cases, prominent in my mind, illustrate this point, and the two methods of treatment which are successful in dealing with such in the Katanga.

The first case was that of a Belgian who had been in the country four or five months only. He had had several attacks of fever at intervals of from two to three weeks when I saw him. Quinine injections brought the temperature to normal within three or four days each time. Daily quinine by the mouth, probably in insufficient quantity, had been given after the injections, which were irregular as to the number given. Fever always returned within three weeks. I adopted my routine, but fever returned. I increased the daily quinine to 10 gr. a day instead of 5, after repeating the routine. In spite of this fever returned, and parasites were found in the blood, whilst 10 gr. daily were being taken. I may note that this is almost the only case in which I have found parasites in peripheral blood under such conditions. I then commenced injections of soamin, 5 gr. being injected weekly for six weeks, placing the patient under my usual quinine routine at the same time. During the next three years this man had no further attack, taking his 5 gr. daily. This was a local infection.

The second case was that of an Englishman who returned from German East Africa with fever. His fever persisted in returning every three or four weeks for several months. He was given soamin, galyl, intravenous tartar emetic and much quinine, but the fever persisted in returning each month until he was given 10 gr. of quinine daily for sixty consecutive days After that he had no more fever.

(*h*) The small fevers which persist for a day or so only, and cause little discomfort to a patient, are more dangerous in their predisposition to blackwater fever than the more severe attacks. Probably this is because such fevers are more often neglected, and medical advice not considered necessary. The very fact of their frequent repetition in this country denotes inefficient treatment.

(*i*) Intravenous injection of quinine I have used freely with natives. The method is one with which I have been cautious in dealing with Europeans, because I have had some fear of precipitating an attack of blackwater fever. I have only used it, therefore, for European patients when symptoms have demanded urgency of treatment, as where malarial coma is present. Such cases are rare in Katanga.

(*j*) Usually one cannot expect to see results from a quinine injection on the following day. The quinine may be killing parasites, but does not affect the toxins which bring about the fever. Therefore the temperature will not be affected in a subtertian injection until about forty-eight hours after the first sporulation following the injection. The rise of temperature expected at this stage will be modified or absent. I see that attention has been drawn to this point by Sir Ronald Ross. I have very frequently seen lack of understanding on this point lead to confusion and errors of diagnosis here, and not only in the minds of laymen. Earlier results from quinine in cerebal and intestinal cases may be due to its immediate action on extra-corpuscular forms constituting capillary emboli.

I conclude these notes with a query: If an individual takes daily quinine in a malarial country and gets no fever, is this due to:—

(1) Killing of the sporozoites at the time they are introduced by the mosquito, so that infection of corpuscles does not take place, or

(2) The holding in check by the quinine of such parasites as are introduced, so that these parasites are unable to multiply to a sufficient extent to produce fever?

The latter is, I believe, the theory in favour. The former seems to me to be possible, and to be supported by my certain knowledge of at least two individuals who leave off quinine at the moment of leaving a malarial country, and in whom no malaria has shown whilst they were on long leave, even under the depressing influences of an English winter. No doubt individual natural powers of resistance differ widely and complicate the question.

To save space in these notes upon quinine in malaria, I have not attempted to touch upon supplementary treatment or the treatment of complications. Such questions, for example, as the objections to giving aspirin in addition when tinnitus aurium is troublesome, or to the necessity of using calomel as a routine. To enter upon this subject would necessitate notes of much greater volume.

Elisabethville,
Congo Belge,
March 4, 1920.

COLLOIDAL DRUGS IN THE TREATMENT OF BILHARZIA DISEASE IN YOUNG PEOPLE.

By F. G. Cawston, M.D.Cantab.

In view of the severe local reaction that is sometimes experienced, when tartar emetic in solution is injected into the small veins of young people, I have recently tried the effect of treating bilharzia patients with some of the colloidal preparations of antimony. In some cases the colloidal preparations have been used alternately with intravenous injections of tartar emetic, whilst others have been treated with "oscol stibium" alone. I have seen some promising results from the use of collosol antimonium, when given intramuscularly; whilst I have been able to test the efficacy of oscol stibium when given orally, intramuscularly and intravenously.

A case was reported in the *Lancet* on November 15, where 3 c.c. of collosol antimonium, intramuscularly, combined with $12\frac{3}{4}$ gr. of tartar emetic given intravenously cured a case of long standing. In October, 1919, I found blackened ova in a child's urine after only 10 c.c. of collosol antimonium given intramuscularly. As these blackened ova were numerous and the urine clearer than when the injections commenced, it is reasonable to suppose that the blackening was due to the antimony, and this opinion is supported by the effect of oscol stibium on several other cases.

Further study of the value of collosol antimonium on persons suffering from bilharzia disease was impossible, as it was only possibie to obtain in South Africa ampoules of the drug which showed the characteristic fungus formation, which renders solutions of antimony tartrate dangerous unless recently made up. However, in January, 1920, I found collosol manganese of value when combined with intravenous injections of tartar emetic in a case of an unhealthy urinary tract, associated with bilharzia infection.

On February 24, R. came to me for treatment for bilharzia disease, contracted four and a half years ago along the north coast of Natal. The hæmaturia was constant, and the urine contained numerous spine-pointed ova. Three c.c. oscol stibium was given on the first day, 2 c.c. on the 25th, 3 c.c. on the 26th, and 4 c.c. on February 27. Each dose was injected through a small needle into the deltoid muscles. Two black ova were found in the urine on February 26. On February 27 the miracidia were seen moving in the shells in the undiluted urine. On February 27 and 28 ♏ xv of oscol stibium were given orally without ill-effect. This same dose was given three times during the day on February 29. The following day the urine was cloudy but clearer, and the centrifugalized deposit contained a few black ova besides living ones. On March 1, 2 c.c. of the drug were given intramuscularly, and ♏ xlv orally without ill effect. On March 2, the patient received 4 c.c. intramuscularly and 90 c.c. by the mouth. Many black ova were found in the urine, and some living ones. This same dose orally and intramuscularly was repeated next day, when the urine was clear but tinged with blood. Microscopically there were much fewer ova and some miracidia swimming free in the undiluted urine. The temperature rose to 102 on the evening of March 3, and there was some diarrhœa for two days, with a rise of temperature to 105 on the evening of March 4, apparently due to the large doses of the drug given orally and intramuscularly on March 2 and 3.

On March 7 the urine was clear and contained much fewer ova, most of which were black. The temperature was normal. The following day 2 c.c. were injected without ill effect, and on the 10th 4 c.c. without ill effect. This dose was repeated on March 12 and 14, making a total of 34 c.c. intramuscularly and 15 c.c by mouth.

From March 8 the urine remained clear and contained only a few ova, and a deformed miracidium was seen swimming about in the undiluted urine on March 10. The ova never entirely disappeared from the urine, but treatment was discontinued on March 16, when the patient returned home. In making the examination for ova on each occasion, the last ounce or ounce and a half of urine passed by the patient was collected and centrifugalized.

On June 3, eighty-one days after the treatment was discontinued, this patient stated that he was enjoying the best of health. There was now no sign of blood in the urine, but microscopically a fair number of ova were seen in the centrifugalized specimen of urine. In every instance the ova showed evidences of degeneration, the miracidia were distorted, and no sign of life could be detected within the shells, even though the urine was well diluted.

The very promising effects of treatment in this case suggests that oscol stibium intramuscularly and orally

should effect a cure, not only of the symptoms but of the infectivity of such cases, if the injections are persisted in for a few weeks.

Intramuscular injections of oscol stibium were given to an Indian coolie whose urine contained much blood and typical spine-pointed ova on March 8. He did not ask for treatment, and took little interest in his condition. Treatment was discontinued on March 16. A total of 19 c.c. were given intramuscularly without any general symptoms. None was given by the mouth. The blood almost completely disappeared from the urine, which became cloudy with phosphates towards the end of the week; this made it somewhat difficult to seek for the ova. On March 12, when the urine was fairly clear, the centrifugalized deposit showed a few pus cells, *no ova*, but two apparently normal miracidia and two distorted miracidia swimming about in the undiluted urine.

Miss P. F., aged ten, came for treatment on March 13, with a five years' history of hæmaturia and constant eneuresis. The urine contained much blood and many spine-pointed ova. ♏ x oscol stibium were injected intramuscularly on March 16, ♏ xx on the 17th, ♏ xxx on the 18th. On the 17th, she reported that "the urine was much clearer already." On the 18th the clear urine contained shreds of mucous membrane, blood cells and ova; ♏ xx were injected on March 19, and on the 20th the clear urine contained only a few ova with very active miracidia within the shells. Occasional injections of tartar emetic into the veins were given, and occasional intramuscular injections of oscol stibium. On April 18 she had received a total of 37 c.c. oscol stibium intramuscularly, 3 c.c. intravenously, and 1½ gr. tartar emetic intravenously. A rigor followed an intravenous injection of tartar emetic ½ gr, but no ill effects could be traced from the injections of oscol stibium which appeared to clear the urine right from the start, but did not free the urine of living ova. At the end of May, she reported that the urine had remained fairly free from blood, though she noticed blood occasionally, and stated that she never wetted the bed now. On May 22 there were numerous ova present in the urine, many were alive whilst others were black. She was given two injections of tartar emetic intravenously, and the case is being kept under observation.

On March 15, A. R., aged ten, reported that he had suffered from bilharzia disease on and off for three years. The blood-stained urine contained numerous spine-pointed ova. By April 13 he had received a total of 35 c.c. oscol stibium intramuscularly and 1·5 c.c. intravenously, with a total of ¾ gr. of tartar emetic intravenously. The urine still contained spine-pointed ova, and on May 3, after a short holiday, the ova were numerous. The blood became less and the urine cleared during the treatment. On several occasions during the treatment the ova became very few, and on two occasions free-swimming miracidia were seen in the undiluted specimen. Though the general health of the boy improved as a result of the injections, the preparation of antimony that was used seemed incapable of eradicating the living ova from the urine.

Small Veins.

On March 19, S. W. reported that he had contracted bilharzia disease from the Palmiet river, where *Physopsis africana* is common. He had recently suffered from much indigestion and frequently vomited. He was 14, and the veins were too small for regular intravenous injections. The urine contained numerous spine-pointed ova. On April 22 the urine still contained ova, though some were degenerated. He had received a total of 1¼ gr. tartar emetic and 38·5 c.c. oscol stibium, 30 c.c. intramuscularly and 8·5 intravenously.

His brother, aged 15, who had contracted bilharzia disease from the same source, commenced treatment on March 19. On April 22 the urine still contained a few living ova and blood. He had received a total of 4 gr. of tartar emetic, 33 c.c. oscol stibium intramuscularly, and 2·5 c.c. oscol stibium intravenously. On May 8 he was given ♏ xv oscol stibium in water three times daily; on May 12 he commenced takiug ♏ xxx daily. On May 22 he was taking 5i four-hourly, and on May 26 he began to take 5ii t.d.s. However, as the urine remained cloudy and still contained numerous living ova, and was no clearer than when the injections were discontinued, it was not considered beneficial for him to continue taking this preparation of antimony by the mouth, and treatment was postponed entirely for a while.

On April 1, H. McI. reported that he had noticed blood in the urine occasionally since bathing in Pondoland two and a half years ago. He was anæmic, weighed 84 lb., and had an attack of right-sided renal colic six months ago. The veins of the arms were too small to risk intravenous injections of tartar emetic, as the boy was only 14; so intramuscular injections of oscol stibium were used, commencing with 1 c.c. and working up to 4 c.c., when intravenous injections were started. On April 26 he received 4 c.c. intravenously without ill effect. On April 28, when he was sent away for ten days' holiday, he had received a total of 44 c.c. oscol stibium, 36·5 of which had been given into a vein. Right from the start the urine began to clear, and the discomfort in passing water disappeared, but there was still some blood occasionally, and living ova were continually present in the centrifugalized deposit from the urine.

On his return, on May 12, the urine contained some black ova, some dead ova, and some living ova, and 1 c.c. oscol stibium was given intramuscularly. The following day a miserable-looking miracidium was seen swimming in the undiluted urine, and 2 c.c. oscol stibium were injected into the vein. As the vein of the right arm was now well developed and the intravenous injections seemed certain, a solution of tartar emetic was substituted for the other preparation of antimony. Two grains were dissolved in 8 c.c. of distilled water and the solution injected before it had become quite cold. A total of 10½ gr. was given in a fornight without any ill effect, except a rise of temperature to 101 degrees after the third injection.

The ova rapidly disappeared from the urine, and disappeared completely on May 24, except for one dead one on May 25. Treatment was discontinued on May 28, and his weight was now 100 lb. He weighed 100 lb. on May 15, and the increase of 16 lb. and general improvement can possibly be attributed to the clearing of the urine during the time he was being treated hy oscol stihium. In this case it would seem that oscol stibium helped to improve the condition of the urine, but that a few injections of tartar emetic were necessary to complete the cure.

Conclusions.

That oscol stibium can be given by the mouth up to a teaspoonful three times daily without ill effects; but that intramuscular injections are much more effective, and tbat intravenous injections from 1 to 4 c.c. may be given with benefit in cases of hilharzia disease.

That oscol stibium and collosol antimonium definitely help to clear the urine and blacken the eggs, and can therefore be recommended in children to pick up the general health and prepare them for intravenous injections of tartar emetic.

That intravenous injections of tartar emetic are usually needed to complete the cure and, if following a course of treatment hy oscol stibium or collosol antimonium, that smaller total doses are required.

QUININE PROPHYLAXIS.

By W. M. McDonald, M.R.C.S., L.R.C.P.Lond.
Medical Officer District No. 2, Antigua, West Indies.

The question of quinine prophylaxis in malaria is of great importance, particularly in military administration where numhers of troops may be suddenly called upon to occupy an area in which mosquito control has not been attempted. Under these circumstances numerous heavy infections will occur while anti-mosquito measures are being organized.

Much has been written of late years in favour of scrapping this method which had long been regarded as a valuable defensive measure against malarial invasion. Quinine prophylaxis is too valuable a weapon to be scrapped, and it is with a view to saving it from the scrap heap that I venture to write these notes. The chief arguments advanced by the detractors of the method are:—

That in the Macedonian campaign, quinine completely failed to prevent the occurrence of relapses. The weak points in this argument are:—

(1) That no differentiation is made hetween quinine prophylaxis to prevent infection of new arrivals and to prevent occurrence of relapses.

(2) That no differentiation is made hetween the different varieties of malaria to be affected hy quinine prophylaxis.

(3) That no weight is given to the records of the results of quinine prophylaxis as used in Italy for the last twenty years.

There is a great difference in the quinine-resisting power of the different varieties of parasites.

P. vivax in its early stages is readily cured by appropriate quinine treatment. *P. falciparum* on the otber hand is extremely resistant to quinine, and the degree of quinine resistance is increased as the parasite increases in age. The youngest forms, although we cannot say with certainty that they will always yield to quinine treatment, are yet mucb more amenable to treatment than the older forms. By the time the crescent form is reached we have a stage at whicb the parasite is practically immune to quinine.

I have not bad enough experience of the third variety, *P. malariæ*, to write with certainity, but the indications are that it is more resistant to quinine than is *P. vivax*. It is obvious therefore that the stage of the parasite is an important factor in assessing the value of quinine prophylaxis

The gametes even of *P. vivax* will offer some resistance to quinine, and the gamete stages of all three varieties offer much greater resistance to quinine than the earlier stages, also it is possible that the merozoites whicb are developed by parthenogenesis are more resistant to quinine than the sporozoites whicb are injected by the infected mosquito.

Therefore quinine prophylaxis is likely to lose much of its value when used in order to prevent relapses.

The variety of the parasite is also an important factor. I have no doubt that if a regiment were moved into a malarial region where we knew that the only type of malaria was benign tertian, that we could with certainity prevent the occurrence of a single case of fever by the use of quinine prophylaxis alone. It is of course impossible for us to know on entering a malarious region what type of infection we are called upon to treat. The cbances are that two or perhaps all three varieties are present.

I am convinced however that quinine prophylaxis efficiently and promptly applied to troops entering for the first time a malarious region would very greatly reduce the incidence of malaria and should eliminate the possihility of any sick rate from benign tertian infection. To be of value, however, quinine should be administered on parade so as to avoid the prohability of the dose heing lost or hidden if left to the individual to take or not as he pleases.

Secondly, as it is of importance that the parasites should be caught in the early stages, quinine should he administered daily, 7½ grs. per day in preference to large doses at intervals of several days.

In the history of malaria the Italian records entirely uphold the value of quinine prophylaxis. In 1902 the Government began the gratuitous distribution of quinine. For the 10 years preceding 1902 the number of deaths from malaria was 14,048 per year. For the 9 years following 1902 the average was 5,435. As to incidence, cases treated from the Agro Romano in 1900 numbered 11,653 before quinine prophylaxis. Average for five years 1908-1913 during quinine prophylaxis 2,974.

When it is remembered that these figures represent the result of quinine prophylaxis, which was entirely dependent on the wish and the memory of the indi-

vidual with regard to dosage, they afford a very strong argument in favour of quinine prophylaxis.

In the penal agricultural colony of Castrades where the quinine was given under orders the results were more remarkable. Cases in 1904, 1905 and 1906, where no quinine was given for the prophylaxis, amounted to 76 per cent. of the force. In 1911, after four years use, there were 5 per cent. only. Such records as these cannot be lightly set aside.

This question is of the utmost importance in tropical medicine, and while it is admitted that quinine prophylaxis may be negligible in value as compared with methods aimed at the extermination of the mosquito, yet it is of great value in that it is a method which can be employed quickly and effectively in places where no prophylactic methods have been previously employed, while methods aimed at control of the mosquito require months of work before any effect is produced.

A NOTE ON THE USE OF THE TOURNIQUET IN OPERATIONS FOR ELEPHANTIASIS SCROTI.

By Robert Howard, M.D., B.Ch.Oxon.

Medical Officer, Pemba, Zanzibar; late M.O. Universities' Mission to Central Africa.

In many of the published descriptions of the operation for elephantiasis scroti, it is stated that hæmorrhage may be considerable in spite of the use of a tourniquet. Some authors, e.g., Stitt, go so far as to recommend operating without a tourniquet, on the plea that the bleeding from the deeper vessels cannot be controlled.

In a recent paper in this journal[1] it was stated, "In amputating these tumours the operator is apt to lose his self-confidence in the early days owing to the difficulty in controlling the bleeding."

There is also great diversity of advice as to the method in which the elastic cord tourniquet is to be applied, some authors recommending a figure of eight round the waist of the patient and the neck of the tumour, others that it should be applied round the neck of the tumour only.

The figure of eight method, though the one originally recommended by Manson, has many disadvantages. Its application and removal is difficult, and as a large part of the tourniquet passes altogether outside the prepared field of operation it is difficult to maintain asepsis during the operation. Further, the pull of the elastic is oblique, and it does not directly compress the neck of the tumour. It is, I imagine, for this reason that it may fail to completely control the hæmorrhage.

On the other hand, if the cord is simply wound tightly twice round the neck of the tumour, its application is much easier, and it does not pass anywhere outside the field of operation; while when the time comes for its removal one only has to remove the forceps or grip which is lying on the towel just in front of the pubes.

To prevent slipping when the tumour is removed towel clips should be inserted into the skin, one on either side, just below the tourniquet; failing towel clips tissue forceps will answer as well. Such a tourniquet cannot slip, and in my experience it never fails to completely control arterial hæmorrhage. I attribute this to the fact that the pressure on the elastic is applied directly all round the neck of the tumour.

I recently removed a large tumour weighing 86 lb., which had a very thick pedicle, but all arterial bleeding was completely controlled. Of course, in the early stages of the operation there is always some venous bleeding from the tumour itself, but this is of no consequence, and if the surgeon has complete confidence in the efficacy of his tourniquet it may be ignored.

In short, I maintain that it is possible to begin an amputation of the scrotum with every bit as much confidence that no arterial hæmorrhage will occur until the tourniquet is loosened as would be felt by a surgeon in amputating a leg after applying a circular tourniquet to the thigh.

[1] Journal of Tropical Medicine and Hygiene, vol. xxii, p. 221.

The Rancidity of Edible Coconut Oil (Granville A Perkins, *Philippine Journal of Science*, November, 1919).—Thirty samples were investigated. The action of light was found to be a powerful, but not necessary, factor in the production of rancidity. Enzymes from the fresh coconut meat has some effect on the keeping qualities of the oil, but sterilization was of doubtful benefit. An oil of low initial acidity remained sweet during two years' exposure to air and light.

Acidosis: its Mechanism, Recognition and Clinical Manifestations (G. M. Piersol, *New York Medical Journal*, vol. cxl, No. 19, May 8, 1920).—Under the term acidosis is included "any modification of the normal equilibrium between the acids and bases within the organism, whereby the power to neutralize the acid is diminished." There are four chief factors responsible for maintaining the acid-base equilibrium: (1) The elimination of carbon dioxide by the lungs; (2) the so-called buffer action of the blood to acids and alkalies; (3) the ability of the kidney to eliminate an acid urine from an alkaline blood; and (4) the production of alkalies in the form of ammonia. A disturbance of one or other of these factors may occur in many different conditions as in diabetes, starvation, pregnancy, nephritis, anæsthesia, burns and many infective conditions in childhood. It is thus evident that acidosis is not a disease *per se*, but is a secondary condition or symptom which appears under a variety of circumstances, and depends upon several different mechanisms for its production.

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THE JOURNAL OF

Tropical Medicine and Hygiene

JULY 15, 1920.

THE DEATH OF GORGAS.

THE death of Major-General William Crawford Gorgas, K.C.M.G., D.S.M., LL.D., D.Sc., is an event of world-wide significance. His name has been associated with events in tropical medicine which have taught the meaning and worth of applied science to an outstanding degree, and ensured him a lasting fame in the annals of medicine.

His has been the directing mind in these events, and the primary place has been assigned him in the great drama which culminated in the practical extinction of one of the greatest scourges of mankind by conquering disease in the Canal zone, and thus rendering possible the making and completion of the Panama Canal.

We may regard Gorgas's work from two points of view—namely, the scientific or classical and the practical, although the two, in his case, are bound together, the latter being the outcome of the former. Starting with a firm belief in the mosquito-malaria theory of Manson, Gorgas came to the conclusion that yellow fever so resembled malaria in its manner of spread and mode of infection as to lead him to believe in a serious attempt being made to eradicate the scourge at its headquarters in and around the Gulf of Mexico. So positive was he of the possibility of this being done that his enthusiasm carried conviction to the Government of the United States of America, and to their great credit they not only justified, but actually supported and furthered in every way Gorgas's conception. As is well known, Gorgas and his colleagues, under the auspices of the U.S.A. Government, undertook the Cuban campaign against yellow fever which ended so successfully. The results of the campaign were the practical extinction of the yellow fever scourge and the ensurance of health and freedom from disease of a large section of humanity. The steps taken are known to all mankind. The enemy was attacked at its base; the breeding places of the yellow fever carrying mosquito were destroyed, as were the breeding places of the malaria mosquito in England in the early parts of the last century. In both cases the method was the same: in England by free drainage of the fen (in other words, the malaria stricken) country, and in Cuba by attention to the more "domestic" environments where the yellow fever mosquito bred. In both cases success was complete. Whereas in the eighteenth and the early part of the nineteenth centuries, when malaria was as prevalent in regions where swamps prevailed in England as in several of the severely malaria-stricken countries of to-day, the steps taken freed England of malaria; so by the energetic campaign in Cuba, not only from Cuba itself, but also from the islands and shores in and around the Gulf of Mexico, yellow fever was swept away in some two years from the start of the campaign. In the former case the drainage of the swamps was undertaken from an agricultural standpoint, with the surprising result of the extinction of malaria. In Cuba the campaign was undertaken as the result of well-considered and closely studied scientific knowledge. The disappearance of malaria in England was what may be termed an accidental result not present to the minds of the swamp

drainers of the country; in Cuba, on the other hand, it was the result of applied science. It was no accidental sequel in the case of Cuba. Gorgas anticipated the result, and convinced his countrymen that the work was bound to succeed. The conversion of the U.S.A. Government and the inhabitants of the States to his belief was perhaps the most difficult task Gorgas had to do. Lot tried to impose his beliefs on his countrymen and failed; Gorgas attempted the same rôle and succeeded, with the magnificent sequel we know. By Gorgas's success the eradication of disease by the application of scientific knowledge has brought it about that science and its application in matters of disease must be listened to and treated as a sanitary and political step of paramount importance; and that no Government can afford to thwart its advance or doubt its teaching and possibilities. The doctor has been held in chains too long; he is beginning to raise his head and to make his voice heard. In the public services he was merely tolerated; as a regimental surgeon he held an honorary but not an honourable position. In the Naval service the same held good. To-day the position is better—nay, good, and it is daily improving. Gorgas has done a great thing for his profession. When an attempt was made, in accordance with precedent, to restrict his power as the real head of the Panama Commission of inquiry and action, he made it plain that as an authority on the subject in hand he was to be unfettered in his methods and plans of work, he fought a great fight for medicine and the medical profession. The days have gone when the voice of the half-crown doctor was neglected; when the lady of title asked her friend if she shook hands with her doctor [the "doctor" on this occasion was a baronet who held the highest position in medical circles], said: "I never do, no more than I would with my baker."

The honour paid to Major-General Gorgas on Friday, July 9, 1920, at St. Paul's Cathedral was in keeping with the work accomplished by the great man. The British Empire paid tribute to this American citizen in a manner that did the Empire credit. No higher compliment could have been paid; yet it was no mere compliment, but a debt the Empire paid—a just debt, and one which honoured the nation that was privileged to settle it.

Official Britain was there, the scientific bodies sent their representatives, private individuals of world-wide reputation begged to be allowed to be present to pay their tribute. The public thronged the streets so that they might raise their hats to this great doctor from America. Not all the Leagues of Nations and Peoples have done so much to bind the United States of America and the Motherland closer together than did the service under the dome of St. Paul's on that Friday in July. At the heart of the Empire the hearts of the people went out to this man. Crowned heads and statesmen receive at times this tribute, but for a "doctor" to be thus honoured shows that at last he is coming into his own. Gladstone said some time ago "the future was in the hands of the doctor," and it would seem that the words of that great parliamentary wizard are coming true.

And what about Royalty? When Gorgas lay sick in the Military Hospital at Millbank, His Majesty King George V visited Gorgas and decorated him with a knighthood of the Most Distinguished Order of St. Michael and St. George. By this act the King represented the feelings of the nation as is his wont, and we his subjects thank His Majesty for thus expressing the feelings of the peoples of the British Empire.

J. Cantlie.

Annotations.

The Reaction of the Saliva (Arthur L. Bloomfield and John G. Huck, *Bulletin of the Johns Hopkins Hospital*, vol. xxxi, No. 350, April, 1920).—Study of freshly expectorated saliva from normal people shows that the reaction tested by the colorimetric comparison method may vary within considerable limits—6·0 to 7·3—although 80 per cent. of the specimens fell within the range of 6·6 to 7·1. The reaction varied in different individuals, and in the same individual at various times apparently without any definite or constant relation to the time of day or to the ingestion of food or fluid. It was temporarily altered by mouth-washes such as Dobell's solution, but only for a short time (thirty minutes). Internal administration of acid and alkali did not seem to influence the reaction of the saliva in any definite manner. Observations on a group of patients suffering from a variety of diseases showed no constant relation between the reaction of the saliva and any particular disease, although the variations covered a slightly wider range than was found in the case of normal group.

The Drugless Therapy of Diabetes (H. S. Stark, *New York Medical Journal*, vol. cxl, No. 19, May 8, 1920).—Individualizing is one of the mainstays in the treatment of diabetes. Prophylaxis should be as conspicuous as therapeutics. Heredity, overfeeding, goutiness, obesity, mental strain and sedentary existence are factors which make for diabetes and should be suitably combated. Drugs, including opium and hormone therapy, are disappointing, and diet is the mainstay of treatment. In considering the drugless treatment of diabetic coma the diet should be relaxed when ketonuria increases. An exclusive diet of proteins and fats must be proscribed, while carbohydrates in the form of potatoes, wheat bread and milk and alcoholic beverages in limited quantities should be allowed. If coma is pending the patient should be put to bed, kept on a milk diet, and oxygen inhalations freely given.

Abstracts.

GUINEA-WORM IN THE INGUINAL CANAL.[1]

By Capt. S. K. Ray, I.M.S. (T.C.)

On the evening of November 11, 1919, I was called to see an urgent case in the hospital, a patient admitted for the treatment of strangulated hernia. His name was Mandi Pechiar, of 147 Labour Corps, aged 20 years. From his appearance it struck me that he had no abdominal trouble. The patient noticed a swelling in the left inguinal region on the evening of November 10, 1919, while he was in his bed. Since then he passed motions and urine and had no sickness. On examination, I found a diffuse oval-shaped swelling in the left inguinal region. The skin of the penis and scrotum was thickened and pitted on pressure. There was no tenderness, the patient had 99 degrees temperature and pulse 108 per minute. No impulse could be elicited on coughing. The local appearance of the swelling simulates an irreducible inguinal hernia. There were no signs or symptoms present requiring immediate operative interference. Cold compress was given in the night with no improvement on the next day. Warm compress was then tried, and on the 13th the swelling had subsided a good deal. A distinct hard lump could be felt and the lump could be moved from side to side with the cord in the canal. I operated on the case on November 20, 1919, with no idea as to what I would meet. The incision was as for an operation of hernia. I noticed a hard lump about the size of a big walnut adherent anteriorly to the cord. There were marked signs of inflammation in the surrounding tissue. The lump was shelled out from the cord and, on incising it, I found it to be a sac containing whitish pus and a guinea-worm 14½ inches long. The wound was sutured with a drain. The patient recovered without any trouble or temperature.

[1] Abstracted from the *Indian Medical Gazette*, vol. lv, No. 3, March, 1920.

Current Literature.

Bull. Soc. Pathologie Exotique. April 14, 1920.

Two Cases of Oriental Sore, contracted in Spain and France respectively. (First case of contagion in France) (P. Ravaut).—The first case was badly bitten by mosquitoes and flies while travelling in Tarragona in the neighbourhood of nomads from Northern Africa. The bites healed, but six months later two sores broke out, from which Leishman bodies were ultimately recovered. In the second case the sores were contracted as a sequel to mosquito bites received in the Pyrénées Orientales, where Kabyles and Annamites were stationed. In both instances the lesions consisted of small inflamed nodules, showing no ulceration or suppuration, but with a tiny orifice in the centre containing a drop of serous fluid. The author considers that as the sores may neither develop to any great extent nor present a very characteristic aspect in European climates, more cases will probably be identified in France if doubtful lesions be carefully studied microscopically.

American Leishmaniosis in Venezuela (E. Tejera).—Sixty-two cases were seen in the State of Zulia during 1917. All were of the cutaneous form except one, which is somewhat surprising in view of the fact that in the neighbouring country, Brazil, the mucosal is the most common type. Of the two remedies used, novarsenobenzol and tartar emetic, the latter produced much the better results, and never gave rise to ill-effects of any kind, however large the number of doses administered. In the only instance in which it failed, the patient was subsequently cured by an Indian who treated the ulcer with herbs.

On Trypanosoma Dimorphon Infection in Horses and Mules (G. Curasson).—Of ten animals treated with galyl four died and six recovered. Two of the former arrived at the veterinary hospital in a moribund condition, and all were in a very bad state when treatment was begun. Though no definite conclusion can be drawn from these results they were much more satisfactory than those obtained from tartar emetic. The galyl was given in two injections at intervals of a week, 3 grm. on the first occasion and 1 grm. on the second; it was put up in ampoules containing 0·37 gr. sodium phosphate, 0·25 gr. of caffeine and 0·25 gr. of sodium benzoate per gramme of galyl, the whole dissolved in sufficient water to fill the ampoule. The œdema of the hind quarters and bursæ, which Dutton and Todd say they never saw, was present in about half the horses (never in the mules) in the hospital, and appeared just before the animal became too weak to stand.

Iodosalyl in Trypanosomiasis and Yaws (Clapier). The writer has tested the value of iodine in sleeping sickness and yaws in the treatment of some of his own native patients, and confirms the generally accepted view that, while iodosalyl is useful in the former condition when associated with specifics, it has no rapid sterilizing power in either.

Remarks on the Hæmatological and Clinical Aspects of Bancroft's Filariasis in French Guinea (Marcel Leger).—Children up to the age of 15, examined at night, showed parasites in the blood in 16·25 per cent., the number of individuals tested being fifty-five. The youngest positive case was

4 years old. During a period of three years *Microfilaria nocturna* was obtained twenty-five times from specimens of urine (adults) showing blood, blood and chyle, or chyle alone. Two fatal cases are described as evidence of the existence of a malignant form of filariasis in French Guinea corresponding to the lymphatites perniciosas of the Brazilians, and described by Carlos Claudio da Silva in 1880.

A Further Contribution to the History of the Guinea Worm (E. Roubaud).—Experiments with *Cyclops viridis* in Paris afforded exactly the same results as obtained recently by Chatton in Tunisia, viz., that though it is possible for the embryo of the guinea worm to live in the general cavity of this host for a period far exceeding that of its normal existence in the larval form (as long as three months instead of some days only), it does not develop or undergo any transformation, the only change before the final dissolution being a slight increase in diameter. It would therefore appear that all species of *Cyclops* do not lend themselves in an equal degree as intermediary for the development of the worm and thus to the transmission of dracontiasis. From the biological point of view, the fact that such abortive infestation of certain species of *Cyclops* is possible provides ground for closer comparison of the evolution of the filaria in question with that of some of the blood-inhabiting filarial parasites.

Note on the Parasitic Ixodes infesting Domestic Animals collected at Mitylene between February and June, 1916 (G. Senevet).—While stationed at Mitylene with the French Army of occupation in the beginning of 1916 the author classified the ixodes he recovered from various animals as follows:—

Host	Ixodes	Male	Female
Bos taurus L. Number examined 5	*Rhipicephalus sanguineus*, Latreille	11	13
	R. bursa, Conestimi and Fanrago	4	1
	R. sinus, L. Koch	—	1
	Hyalomma ægyptium, Linné	3	1
Equus asinus L. Number examined 5	*Rhipicephalus sanguineus*, Latr.	—	4
	R. simus, K.	—	3
Canis familiaris L. Number examined 5	*Rhipicephalus sanguineus*, Latr.	4	7
	Hyalomma syriacum, L. Koch	—	1
Capra hircus L. Number examined 1	*Rhipicephalus bursa*, L. and F.	5	3
Testudo Sp. (?)	*Hyalomma syriacum*, Koch	5	—

"Charlatans and Pseudo-parasites" and "Eye Worms" (G. S. Swaminath).—In connection with two notes under the above titles published some time ago by Professor R. Blanchard, the writer relates that while in Calcutta in 1917 he saw a Chinese woman "curing" toothache by persuading the patient that the trouble was caused by maggots, and then, after pronouncing incantations and receiving a fee, producing the offending larvæ by sleight of hand.

Contribution to the Study of Osteoporosis or "Big Head" in Horses as it occurs in New Caledonia (Ch. Nicolas).—After seeing two horses cured, at least temporarily, by applications of Méré ointment, the author is inclined to the opinion that the condition is not due to absence of lime in the food and drinking water, as believed by some authorities, but rather to some infectious organism.

Malarial Infection and Novarsenobenzol (G. Senevet).—Referring to an article in the March number of the *Bulletin de la Société de Pathologie Exotique* by P. Brau and J. M. Marque, the authors suggest that the favourable results obtained might have been influenced by variations in the season or climate. They also point out that the said results do not concord with those published by other writers, who are practically unanimous in declaring that as far as *Plasmodium falciparum* infection is concerned no form of arsenical treatment is effective in itself, though it may be of value when employed in conjunction with quinine.

A New Treatment for Oriental Sore (Cretan) by Local Injections of Emetine Hydrochloride (Georges Th. Photinos).—The emetine is injected under the sore, holding the needle almost parallel to the surface. The *Leishmania tropica* frequently disappear after one dose varying from 0·01 grm. to 0·05 according to the size of the lesion. Cure is radical and complete, and is usually effected in from twenty to thirty days. Details of thirteen successful cases are given.

The Trypanosomiases of Animals in Venezuela (E. Tejera).—*Equidæ*: The two conditions known locally as *peste boba*, *hermosura* or *tristeza*, and *desrengandera* are described from their clinical aspects. The former proves fatal in 80 per cent. of cases, the latter in nearly 100 per cent. Both are due to *Trypanosoma venezuelense*, the vector of which is unknown. Experiments with this organism on guinea-pigs, rats, mice, one horse, two monkeys, a cat and a calf, showed it to be fatal for all but the last-named, from whose blood the trypanosomata disappeared eleven days after inoculation, though guinea-pigs were infected from it five months later.

Bovidæ: A trypanosoma recovered from the blood of a cow suspected to be suffering from piroplasmosis appeared to be identical with that described by Leger anl Vienne under the name of *Trypanosoma guyanense*.

Craw-craw or Filarial Itch, and its Origin in Subcutaneous Onchocerca volvulus Cysts (J. Montpellier and A. Lacroix).—Many of the native troops from French West Africa showed a papulo-vesiculo-pustulous eruption, accompanied by moderate irritation, which corresponded very closely

with the craw-craw originally described by O'Neil in 1875. The skin in the affected areas was finely wrinkled and the natural creases were accentuated, but there was no pachyderma. The first stage of the eruption consisted in flat pustules; on these vesicles formed, which pustulized, dried and left behind depressed scars varying greatly in size. No fever or general symptoms were observed beyond an inguinal adenopathy and an increase in eosinophiles of from 5 to 40 per cent. Embryo filaria were present in the papillary and subpapillary layers of the derma in every case examined, but never in the epidermis, the vascular system or the blood, either by day or night. They were found in greatest abundance in the healthy skin, and only rarely in the suppurating pustules. Cysts discovered in a few individuals yielded one male and several sections of a female filaria presenting the appearance of *Onchocerca volvulus*.

Hypertrophic Osteitis and Yaws (Dr. Clapier).—The possibility of a relationship between goundou and yaws suggested by Castellani and Chalmers has been investigated by the writer in French Equatorial Africa. Six hundred patients suffering from yaws showed an accompanying osteitis in so many cases that until experimental evidence be forthcoming, he considers connection between the two conditions clinically proved. Both long and and short bones were affected as well as the nose, goundou being indeed the form least frequently seen. The osteitis was seen in children as well as adults, not at the onset of the yaws, but some months after the latter had become generalized, or even after cure had apparently taken place. Fourteen cases are described as examples.

The Roumanian Epidemic of Exanthematic Typhus during the late War (J. Cantacuzène).—After the Roumanian defeat at the end of 1916, when the exhausted army was crowded together with the civilian population, without food, clothes or sanitary organization, typhus, until then unknown in the country, set in with such violence, that in February, 1917, the railway platforms and hospital approaches were piled with corpses. The culminating point was reached in March, after which the cases became fewer until July, when they practically ceased. In the autumn of 1918 a slight recrudescence occurred, but was immediately extinguished in all districts except those occupied by German troops, who, while effectively safeguarding themselves, deprived the inhabitants of all means of combating the infection. The average mortality during the epidemic was between 15 and 17 per cent., and increased with the age of the victims; among the doctors it was 41 per cent. An outbreak of an exceptionally virulent form of relapsing fever occurred simultaneously and often in association with the typhus attained its maximum at the same time, but declined earlier. On the other hand, scarlet fever, usually very frequent and violent in Roumania, disappeared during the typhus epidemic, and is only now beginning to show itself again. The extensive gangrene seen in Serbia in 1915 was entirely absent. In many cases the nervous centres were attacked, and symptoms resembling hydrophobia and tetanus respectively were observed. Diarrhœa was not rare, and intestinal hæmorrhages were seen from time to time. Characteristic lesions noted post-mortem were encephalo-menigitis (invariably) and a petechial eruption of the gastric mucosa (generally). In some rapidly fatal cases cholera was associated with the typhus; it never, however, attacked those who had been vaccinated against it. All the evidence collected during the epidemic pointed to the louse as carrier of the infection, and as soon as this parasite was eradicated the typhus disappeared.

Reviews.

MALARIA AT HOME AND ABROAD. By S. P. James, M.D., D.P.H. London: John Bale, Sons and Danielsson, Ltd. 1920. Pp. xi + 234. Price 25s. net.

During and since the war interest in tropical diseases has become more widely diffused. Many practitioners who in ordinary circumstances would have never left these shores were sent abroad on active service, many of them to tropical areas, where they were thrown into intimate contact with cases of malaria. This fact, together with the return to this country of large numbers of soldiers infected with malaria, has awakened a much wider interest in this subject of malaria.

Cases of malaria, too, of indigenous origin have been found to occur in a number of widely separated places in this country, a considerable local spread of the disease having occurred in the county of Kent. It has also been found that there still remain a few areas in England where endemic (true indigenous) malaria still persists.

The appearance of Colonel James's excellent monograph dealing with "Malaria at Home and Abroad" is most opportune. It gives a lucid and detailed description of the symptomatology, pathology, diagnosis and treatment of malaria, together with the practical work necessary to inquire into malaria, malarial surveys, the prevention and eradication of malaria and the control of mosquitoes.

The volume is dedicated to Sir Patrick Manson, who, on being asked to write a "Foreword," replied: "I have kept your book long, but it is a big affair which does not admit of skipping. I have read it from *alpha* to *omega*, and can conscientiously say that it is a fine performance, which is bound to do an immense amount of good. The book requires no foreword from me or anyone else; it speaks for itself." A word to the wise is sufficient!

Original Communication.

EXPERIENCES OF MEDICAL AND PRISON WORK IN A NEW COUNTRY (KEDAH, MALAY PENINSULA).

By A. L. Hoops, M.D., D.P.H., B.A., T.C.D., Cert. Trop. Med., London.

State Surgeon and Superintendent of Prisons, Kedah.

Kedah is one of the non-federated Malay States on the west coast of the Malay peninsula; it came under British protection in the year 1909, along with the small adjacent state of Perlis, and the considerable states of Kelantan and Tringana on the east coast. Until 1909 these four countries were under the suzerainty of Siam, which latterly had encouraged them to improve their administration by the introduction of European advisers.

It was thus that in March, 1906, I was seconded from the medical service of the Straits Settlements to organize medical and prison departments in Kedah. The field was new.

Even in Alor Star, the capital of Kedah, a town of 10,000 people, situated some eight degrees north of the equator, there was no qualified medical man, and no hospital; the gaol was an overcrowded den, where from one quarter to one half of those confined died each year, chiefly from bowel diseases. There was no vaccination; smallpox was endemic, and most adults bore traces of it. There was no proper registration of births and deaths. It was necessary to collect and train native staffs, to build institutions, to draft rules and enactments suitable for a primitive country, and to have them enforced. In all these matters constant encouragement and assistance were received, not only from the European advisers to government, but also from the Malays on the State Council (who at present number four, the British adviser being the only European member).

During my first year, 1906, H.H. Abdul Aziz bin Tajudin, a most enlightened prince, was President of the State Council. On his death he was succeeded by his brother, H.H. Tunku Mahmud, and later by H.H. Tunku Ibrahim bin Abdul Hamid (eldest son of the Sultan of Kedah), who has been Regent since 1913.

These three nobles gave me generous sympathy and useful advice. Without their aid, and that of other leading Malays, such success as has been achieved in medical and prison development would have been impossible.

I am also deeply indebted to Mr. W. George Maxwell, C.M.G., British Adviser, Kedah, from 1909 to 1914. Son of Sir William Maxwell, a distinguished administrator and Malay scholar, Mr. George Maxwell is himself unsurpassed in knowledge of the Malay people, their habits, customs and modes of thought. He is in sympathy with medical work. To his initiative is due the early completion of the North Kedah waterworks scheme.

In this article I shall confine myself to my experiences of cholera in Kedah.

Some Account of four Cholera Epidemics in the Malay State of Kedah.

Kedah is 130 miles long, and not 50 miles across at its broadest part; area about 3,800 square miles, population in 1911 quarter of a million.

Kedah, with Perlis, is the most northern state on the west coast of the Malay peninsula. To the north and east it is hounded by the Siamese provinces of Sinzora and Patani; its west is mainly seacoast, extending nearly to Penang island, while to its south-west and south lie Province Wellesley and the Federated Malay State of Perak.

Kedah is separated into two distinct parts, North and South Kedah, hy Kedah Peak, a mountain 4,000 feet high, running down to the sea, and inland to this hy swamps. From time immemorial North Kedah has been scourged hy cholera every two or three years; the physical barrier between North and South Kedah has prevented most of the epidemics from spreading to South Kedah.

In undeveloped Malaya travelling was almost entirely hy rivers or hy sea. No river gives access from North to South Kedah; the few tracks leading round Kedah Peak, or through the swamps inland, were so difficult that travellers usually made the journey from North to South Kedah hy sea, via Penang. During cholera epidemics, quarantine, imposed by the Penang health authorities, almost closed the sea route, and thus protected South Kedah, as well as Penang, Province Wellesley and Perak. Dry weather is the rule from January to March, while there are rains in the other months, with a distinct wet season from August to October. Kedah was visited by epidemic cholera four times during the eight years 1907 to 1914. Each outhreak commenced in the capital town of Alor Star which is situated on the (North) Kedah river ahout 50 miles by sea from Penang.

With the development of communications each epidemic spread more widely and claimed more victims than its predecessor. During the period the water supply of the whole country was from rivers or shallow earth wells. It was especially bad in Alor Star, where the river hecomes brackish in dry weather, and the earth wells contain an evil-smelling soupy liquid. Native jamhans (latrines) are commonly placed over rivers or streams. Where the water supply is from a well, the jamhan is near the well, and often on higher ground. After defæcation, ahlution is performed at the river or well. Conditions favouring epidemic cholera are therefore not wanting. It was evident that a good and non-pollutable water supply was the only radical remedy. Such a supply was provided late in 1914, an impounding reservoir being formed in the hills, eighteen miles north of Alor Star. Thence water was distributed by pipes to the capital, and many other centres of population in North Kedah. During the five and a half years since that date there has been no epidemic cholera in any part of Kedah.

The building of a hospital in Alor Star was started in 1906, and soon afterwards a quarantine camp, for the isolation of cholera and smallpox patients, was established. Special difficulties in dealing with the

first two epidemics arose from shortage of staff. The dressers and attendants, though they worked devotedly, were mostly Indians. As years went on many Malays were trained in elementary sanitation, and some became efficient dressers. The gaol afforded a splendid training ground; several ex-prisoners are at present bonoured members of tbe medical department. The early bostility of tbe Malays was converted to friendship and trust in 1911 and 1914, when many of their Mahommedan fellow countrymen worked amongst tbem. Tbough death registration was made compulsory, concealment of the cause of deatb, with consequent lack of precautions, greatly increased the cases and mortality, especially in remote districts.

I.

The first epidemic was in August—September, 1907, after a long spell of dry weather in what is usually a wet season. 330 cases were recorded, witb 247 deatbs. It is probable that at least double tbis number of cases and deaths occurred. The disease did not spread much outside Alor Star and the villages between it and tbe sea. There was no extension to Soutb Kedab.

II.

The second epidemic was in March and April, 1908. It was more widespread. 686 cases were recorded, with 541 deatbs. Tbe number of deaths that year exceeded tbe normal by over 1,000; it may be taken tbat tbere were at least 1,000 deatbs from cholera. The disease spread to Kota Kuala Muda in South Kedah and for some distance up the Muda River. 125 of tbe reported cases were in Kuala Muda district. Tbree otber districts in Soutb Kedah, however, were not affected.

III.

The third epidemic was in 1911, a very dry year. It lasted nearly six months, from February to July. 1,211 cases were recorded, with 966 deaths. The cases were more fully reported than in previous epidemics; but it is probable that not less than 1,500 deaths were due to cholera (as the excess of deaths over a normal year were more than this). Alor Star and the environs suffered heavily; most parts of North Kedah were affected. There were 170 deaths in Sungei Limau, on tbe seacoast, and Lankawi island suffered for the first time. Strange to say there was no extension to South Kedah, although tbe epidemic was so prolonged.

IV.

The fourth epidemic was in the year 1914. It really started in the last week of November, 1913, when there were eleven cases in Alor Star and Kuala Kedah. Unlike previous outbreaks it began after an excellent wet season and before the rains had ceased, but only became serious when drought set in. It lasted a full five months, until after the middle of April, 1914. During this time, 2,196 cases and 1,502 deaths were registered. Very few places in North Kedah escaped. The disease spread to Kuala Muda in South Kedah, and thence upstream to Baling, but Kulim and Bondar Bahm districts in South Kedah remained free. There was no case in May, but tbere was a recrudescence in June, when tbere were 70 cases and 43 deaths reported in and about Alor Star, and a few were returned from Baling.

The number of deaths registered in Kedah during the year was 7,551, against 4,873 in the previous year (a normal one), an excess of 2,678. There was no other disease epidemic in the country; nearly the whole increase must therefore be attributed to cholera, which caused, I estimate, not less than 2,500 deaths amongst about 3,600 cases (the death-rate averagad nearly 70 per cent.). The bulk of the concealment was in Kuala Muda and Baling districts, where though the deaths exceeded those of the previous year by 1,051, only 325 were returned as due to cholera.

V.

Year A.D.	Approximate deaths from Cholera
1907	500
1908	1,000
1911	1,500
Dec. 1913 to June, 1914	2,500
Total ...	5,500

It is a conservative estimate that tbere were 5,500 deaths from cholera in Kedah in tbese eight years out of a total of 37,000 odd deaths from all causes: tbat is to say cholera caused nearly 15 per cent. of the total death-rate over the whole period. In the year 1914, one-third of all tbe deaths in the country were due to cholera.

In addition to the four epidemics, tbere were sporadic cases in Alor Star in January, 1910 (two) and in January, 1913 (two). In the latter montb the supply of tank water from a galvanized roof catchment area over tbe market to tbe people of Alor Star, probably averted another epidemic.

VI.

Some text-books accept as a truism tbe statement that cholera is always imported; while this may be so in countries with good water supplies and sanitation, I am convinced it has not been so in Kedah. Not one of these outbreaks has been traced to an imported case. On the other hand, they have commonly been associated with drought and badness of the river water, and have usually commenced in the same part of Alor Star Town near Titi Batu. There are undoubtedly conditions in Alor Star favouring the life of the cholera bacillus; not only does the clay subsoil form an ideal culture medium for the bacillus, when the disease is active (in a more open soil there would be purification by natural filtration), but after the disease dies down the organism may perhaps continue to exist, although harmless, in the soil or water, until a combination of conditions partly unknown to us, but of which drought and bad water are two, causes it to regain its virulence, and start a new epidemic. The growth and spread of the cholera vibrios are favoured by the nature of the river and shallow well water around Alor Star; the district suffers accordingly. On the other hand, from Gurun,

near Kedah Peak, to Sungei Patani, where the subsoil is more open (much of it is latorite) and the water better, cholera has never taken a hold, although infected persons have frequently visited these places; but as soon as it passes them and reaches Kota Kuala Muda where the soil and water resemble those of Alor Star, widespread infection again occurs.

VII.

Dr. Stanton, of the Institute of Medical Research, Kuala Lumpur, visited Alor Star towards the close of the late epidemic, early in April, 1914. On his return to Kuala Lumpur, he did some interesting experiments with water drawn from the Wan Mat canal, which is practically Alor Star river water. Emulsions of cholera bacilli from a case were added to samples of this water; it was found that even when the water was previously sterilized, the vibrios grew and multiplied rapidly in it. On the contrary, emulsions of cholera bacilli added to Kuala Lumpur tap water (unsterilized) rapidly died out. Dr. Stanton therefore, concludes that the Alor Star river water itself contains ingredients which are favourable to the spread of cholera.

Against the possibility of the Kedah epidemics arising from fresh imported cases, Dr. Stanton favours the hypothesis that there is within certain areas in Kedah a natural reservoir of virus, the renewed activity of which is derived from some special combination of circumstances. Such a reservoir may he in man himself, or in water or in some other medium.

Recent work done by Greig in India has proved that the cholera bacillus can exist for considerable periods in the gall bladders of apparently healthy persons who have recovered from the disease; and when passed in the stools of such carriers can infect other healthy persons. It is known that typhoid fever is mainly spread by healthy carriers of typhoid bacilli, and that some typhoid carriers remain infective throughout the whole of their lives. Should the cholera vihrio he capable of a similarly prolonged existence, one need go no further to find the exciting cause of our constant outbreaks.

"The factory of the virus is man himself." With a good water supply however, and edicient scavenging, the other conditions essential for an outbreak such as the last one, no longer exist in Alor Star.

VIII. *Spread of Cholera.*

In sections VI and VII it has been suggested that the cholera outhreaks in Kedah are not due to imported cases, but to the persistence of the cholera vibrio in the country between the epidemics, either (1) in an altered and unrecognizahle form (temporarily non-pathogenic) in the earth or water, or (2) in the gall bladder of human carriers. It is certain that to infect man the cholera vihrio must be swallowed; by what channels then does cholera spread? Largely by the same agencies as typhoid fever: Food, fingers and flies (Osler's Trinity).

Food and Flies.—Infected water is the commonest vehicle; it becomes infected in many ways; directly from the excreta (fæces, vomit and urine) of persons who have cholera; by the washing of dead bodies, infected clothing and other articles in wells, or rivers used for drinking, by the dipping of infected buckets in wells or infected cups, &c., in large drinking vessels; conversely cups, plates, &c., may be infected by washing them in infected water. The washing of the mouth in infected water can produce the disease. I have frequently noticed ducks and hens walking under cholera infected houses on ground which is permeated with cholera dejecta. Thence they contaminate the wells, padi, mats, &c., around the house. Gimlette condemns the eating of fish from infected rivers. Shell fish scraped from the hottom of ships, have been found to contain cholera vibrios. Shell fish, stale fish, over ripe fruit and uncooked vegetables frequently cause cholera. Sometimes these articles are actually inoculated with cholera bacilli by handling or by flies which settle first on cholera dejecta and then on them. Even if uninfected, such foods predispose to cholera by causing dyspepsia and diarrhœa. In three different places in North Kedah the first cases of cholera followed the drinking of toddy, viz., in Alor Star, where the 1914 epidemic started in a toddy shop; at Sungei Wang, a place with an ideal water supply, where nevertheless eleven cases of cholera occurred amongst 90 Tamil coolies after a toddy debauch, and at Jitra, where the habitués of the toddy shop were the first victims. An analysis of the toddy for vibrios would have been interesting, but could not be carried out. Flies may have infected it, as they frequently infect milk.

Toddy drunk to excess upsets the digestive system and causes severe vomiting and purging, and therefore always acts as a predisposing cause. All Kedah toddy shops were closed after these outbreaks. Sherbet, ice-cream, sweetmeats, and the food sold off stalls in the streets and at native coffee shops are specially liable to contamination by flies, and are also often made with infected water, as are native mineral waters. In gaols and other institutions it has been remarked that although every other precaution has been taken the disease continues to spread until all vessels which receive dejecta have disinfectant placed in them before use. When this is done flies cannot settle on the dejecta; new cases then cease to occur. Ants abound in Malay houses, and doubtless take a minor part in the spread of cholera. So do mosquitoes and other insects.

Fingers.—All personal contact may be classed under this head. In this country it is a common cause of spread. Males are often infected at funerals, where they assist to bathe and bury the dead, and then partake of food. In the house women are more exposed to infection than men, as they do more of the nursing and washing of clothing. In a Malay house one usually finds the patient on a mat. His head is on the knees of one friend, two more sit on either side shampooing his limbs, while a fourth waits on him. The sufferer passes his motion under him, and often vomits on the floor. The whole of his attendants become infected in a few hours. Portions of the dejecta drip through the loose bamboo floor to the ground below, whence they sometimes reach the well. All the rags and old clothes in the

house are used to mop up the wet around the patient. They are not destroyed afterwards.

The spread of cholera upstream, as pointed out by Fox, S.M.O. Perak in 1910, is frequently due to transmission in bundles of clothing which have been soiled by cholera dejecta. Gimlette especially remarks on the spread of cholera by the Tamil loin cloth. In Malay countries a large proportion of the population lives on the waterways which were in the old days the only means of communication. In Kedah cholera invariably spreads upstream—a proof of the large part that personal contact takes in its spread. Of the many persons who are undoubtedly infected with cholera only a comparatively small proportion develop symptoms.

The cholera vibrio apparently cannot infect a healthy stomach, but is destroyed in it or passes through the system without doing damage. MacNamara quotes an example where nineteen persons drank water which had been contaminated with a rice water stool. Only five developed the disease. This explains why only one case is the rule in a rural household, although every member has probably swallowed the cholera vibrio.

IX. *Preventive Measures.*

A consideration of the channels by which cholera is spread suggests the steps that should be taken to limit an epidemic.

(1) First among these is the provision of *pure*, or, at any rate, of *sterile drinking water*. Drinking water from any suspected source must be boiled before use, and while boiling placed in a closed vessel. On no account should water after boiling be filtered through a drip-stone or any other kind of filter. If deposits in it render filtration desirable it *should be filtered before boiling*.

In Alor Star a galvanized iron catchment area was put up over the market after the 1911 epidemic. The tanks connected with this held 480,000 gallons of rain water. Though the river had still to be used for bathing, the drinking of river water was forbidden; no bathing water was allowed to be carried to houses. Sikh guards were put on the river to enforce the restrictions. The townspeople were permitted to take water for drinking from the tanks to their houses free of charge. The water was carried in empty kerosene oil tins; to increase the domestic stocks the Government bought and lent nearly 5,000 kerosene oil tins (each holds 4 gallons). When this water began to run short in January, 70 tons of drinking water were brought from Penang daily in a water boat. Part of this water was pumped off into tanks which the Government erected in the village at the mouth of the Kedah River (Kuala Kedah). Thence surrounding villages were also supplied. The remainder was brought to Alor Star, pumped off into tanks at the jetty, drawn into kerosene oil tins, and issued.

This supply was not available for the coolies working on railway construction in 1914, of whom there were about 3,000 in the country. For them, 5-ton tanks were erected at various points. In these tanks river or well water was boiled. It was drawn off into empty petrol tins, which were then closed by screw tops. These tins were distributed to the coolie lines along the railway construction (40 miles).

In March, the railway authorities also erected a Jewell filter near Kobah; it was found to effectively clarify and sterilize water from a most filthy pond (most of the wells had gone dry). All drip-stone filters were taken from the railway coolies.

The Government erected tanks for the boiling and distribution of water at the worst affected villages in the country, such as Langgar, when the only water supply was from a stagnant and heavily infected stream. The people were everywhere ordered to boil their drinking water. Sanitary tindals went round the rural districts disinfecting every well with potassium permanganate crystals. Where the water is muddy and contains much organic material, I fear that the potassium permanganate quickly becomes inert. Late in the last epidemic I was able to procure a limited amount of thalassol, a hypochlorite of magnesium disinfectant and deodorant. It may be added to drinking water in the proportion of 1/1000 without causing an unpleasant taste. It is colourless, and is especially useful as a rapid disinfectant of wells. If there is much organic matter, I believe it to be better than potassium permanganate.

(2) *Disinfection chemical.*—For general use a good coaltar disinfectant is the best. Izal or Sanitas Okol mix well with both fresh and salt water: a solution of one ounce to one gallon is sufficient in strength. For throwing on damp places quicklime, and where obtainable, chlorinated lime, is unsurpassable. For disinfecting valuable clothing a solution of carbolic acid is preferable to coaltar. Dead bodies may be bathed in water to which perchloride of mercury has been added. It is unnecessary to go outside this list of disinfectants.

In Alor Star town the Sanitary Board made abundant use of disinfectant in night soil, in drains, watering roads, &c. They also kept control over bakeries and the manufacture of mineral waters, and native drinks and sweetmeats. It is fortunate that in Kedah prisoners are available for extramural labour. Prison gangs cleared every street house in the town seriatim under the senior warden's supervision. Each house was cleared of its impedimenta, and washed out by means of a fire hose from top to bottom with a dilute solution of coaltar disinfectant. The walls were sprayed. Over 600 houses in Alor Star were thus treated. Every house in the village at Kuala Kedah was also done. The same routine, but with a stronger solution, was carried out in each house where cholera occurred. Quicklime was freely used in drains around latrines. Stretcher parties of prisoners were on duty in the town, day and night, to carry cholera patients to the quarantine camp. The work of the sanitary tindals in the rural districts may conveniently be recorded in this section. There were ten of these parties, three men in each. The tindal was sometimes a hospital attendant, more often an intelligent ex-prisoner who could read and write, and had shown aptitude in a previous epidemic. The other two members of the party were always prisoners. They took with them a good supply of disinfectants,

a sprayer, buckets, an astringent diarrhœa mixture and 2 gr. tabloids of potassium permanganate. They had orders to disinfect every well on their route, and to advise every household to boil their drinking water and take the other precautions detailed in our cholera circular. Boats and bullock carts, which are frequently infected, were disinfected when necessary. Their instructions on reaching an infected house were :—

(*a*) Put the patient in a separate room in the house or in a corner or outhouse. Remove everything, except the sick man's bedding and clothing.

(*b*) Wash all pots, cups, mats, bedding and utensils, and the whole house in disinfectant, and put everything out in the sun.

(*c*) Put lime under the house, and especially under the part where the patient lies, and under the kitchen, and wherever the ground is damp.

(*d*) Disinfect the well with permanganate crystals.

(*e*) Fill a vessel with disinfectant and keep it at the sick man's door; order his attendants to wash away his vomit and motions with it, and to wash their own hands and feet in it when entering and leaving his room, and especially before eating and drinking.

(*f*) All drinking water is to be bottled and kept in a covered vessel.

(*g*) Motions or vomit which have been passed into a pot are to be mixed with disinfectant and buried away from the water, or burnt if fuel is available.

(*h*) The attendants on the sick are not to admit other friends or relatives to visit the sick person, and they themselves are not to mix with outsiders.

(*i*) Treatment is to be offered but not forced on the sick person. (Some of the tindals took permanganate tabloids themselves to prove their harmlessness to the household; in this way their use was encouraged, and I believe that the lower death-rate in the 1914 epidemic may be partly attributed to this.) The bathing of the sick in cold water, a common practice, must be prohibited.

(*j*) Directions about diet as in section 21 of the circular are to be given to the attendants on the sick.

(*k*) The dead are to be buried privately, and quickly. Disinfectant is to be mixed with the water used for the ceremonial bathing of corpses. For this purpose strong uncoloured perchloride of mercury solution was supplied.

Note.—When there is cholera about, some cases will always escape detection. It is therefore important to carry out thorough disinfection in the case of every death (to whatever cause attributed) in an affected area. This has been done in Kedah where the strength of the staff permitted.

(*l*) All who assist at a burial are to be bathed in disinfectant.

(*m*) The clothes, mats, &c., of the dead are to be burnt.

(*n*) After a death the house and every person and thing in it are to be disinfected. The inmates are not to mix with outsiders for seven days.

Regular reports of new cases and deaths were sent in to headquarters by sanitary parties. Their work was periodically inspected by Medical Officers.

Depots of disinfectants were formed at centres such as police stations and penghulus' houses.

At the height of the 1914 epidemic, including large town parties under senior warder, rural parties, toties (night soil scavengers), water parties, quarantine camp convict nurses and cooks, &c., an average of 100 prisoners was employed on cholera duty. 89 prisoners received remissions of sentence for good work. The prospect of a remission made the majority very keen.

Cases amongst prisoners.—There were 23 cases of cholera amongst prisoners, and nine deaths (average daily number in prison 280); of these prisoners, six (three on intramural and three on extramural labour) were not employed on cholera duty; one had dysentery on admission to prison, and afterwards developed cholera; one had cholera on admission to prison; two were in cholera burial parties; eight were working in disinfecting parties (one hospital, three town, four rural; of the rural, three were infected at the same place, Langgar); three were carrying water from the river for washing purposes; two were in attendance on cholera sick; total twenty-three.

Nearly half were infected during the first month; infection was doubtless due in most cases to neglect of precautions. All prisoners on cholera duty were bathed in a coaltar disinfectant, and had their clothes changed at the prison gate on their return, and were kept in separate wards. Their nails were cut short.

(3) *Disinfection by fire and heat.*—The sterilization of water by boiling has been mentioned. Infected clothing is best sterilized by boiling, and boiling water may be used to wash household utensils. The clothing, mats, blankets, curtains and other soft effects of all people who either die or recover from cholera should be burnt, unless they are boiled. The rays of the sun are a most powerful disinfectant. The whole contents of houses should be spread out and placed in the hot sun for five days running. If thus thoroughly exposed in a dry place they will become sterile. In the case of Malay houses the part of the bamboo floor on which the patient has been lying may be pulled out and burnt, Fox and Gimlotte recommend that the whole of the underneath of the floor be scorched by the flame of a torch. If the house is a cheap one and surroundings insanitary, it is better to burn the whole house and effects, should two or more cases of cholera occur. Compensation must be paid. Dead bodies are best disposed of by cremation. In the case of non-Mohammedans I adopt it wherever possible.

(4) *Isolation and quarantine.*—When cholera occurs amongst a labour force the sick coolie must always be moved out to a quarantine hospital or shed, his belongings destroyed, and room disinfected. Further cases may necessitate the burning of his quarters. I am however much opposed to taking large numbers of coolie contacts used to healthy work, and a free life, away to a quarantine camp. Where there is European supervision as on rubber estates, railway construction and other Government works, it is better, after carrying out a thorough disinfection of all contacts and their belongings, to place them in one line apart from the rest of the labour force, feed them

well, and allow them to do their usual daily task. After seven days without a case all restrictions may be removed. This plan I adopted amongst the railway construction coolies, during the whole 1914 epidemic—58 cases (30 deaths) occurred amongst them in six months—strength of labour force 3,000. Twenty-two of these cases (mostly due to the carelessness of one dresser) were in one month, March. I believe that, had all contacts been carried off to a quarantine camp, there would have been more cases and the whole work of construction would have been stopped in places.

Mental depression, fear and fatigue, are great predisposing causes of cholera. These influences must be combated by altering the contacts' mode of life as little as possible, and by feeding them well. This system was followed by estate managers also, with the result that in 1914 only three estates out of 70, employing 9,000 coolies in the affected districts became infected. Only 18 cases occurred on these three estates; similar measures were taken with police, &c. Had protective inoculation against cholera been practised in Kedah, the small number of cases amongst railway and estate coolies would have been attributed to it. It was not possible to introduce it and retain the confidence of the people.

The isolation of sick private persons must be aimed at, but cannot always be carried out in a country like Kedah; undue harshness leads to concealment and makes matters worse. Where there is a hospital available the patient must if possible be removed to it, and his household kept under observation for seven days. If he is treated at home, a guard should be placed on the house, and the inmates quarantined with himself and the number of his attendants restricted. When necessary, food must be supplied to the household.

Infected shops must invariably be closed. In rural areas however, when the disease spreads, it is impossible to quarantine the house of every infected ryot. Occasionally the sufferer can be moved to an empty house or shed; usually he must be treated in a separate room in his own house, or in a corner of it, when there is only one room. More can be done by sanitary parties of his fellow countrymen than by any other agency. They can explain the cause of cholera and the orders and precautions recommended, and instruct the household in carrying them out. Any beneficial native customs must be encouraged; for instance the "Tali Pupoh" which prevails in some parts of Kedah and in Kelantan and in other Malay States.

The bomo (village medicine man) places a string from which bent twigs and leaves depend across a path leading to an infected house or kampong. Visitors are not allowed to enter past this string, nor the household to come out. Sometimes a tali pupoh is also put up to protect an uninfected area from infection. As a rule, persons are afraid of the hantu (spirit) which is guarding the tali pupoh, and do not transgress it.

Although land and river quarantine guards have been abandoned in Europe, they have their place in a new country. By these means, when there is not too much traffic, it is possible to partly cut off an infected area. The non-spread of cholera to South Kedah in the third epidemic was, I think, due to a quarantine of this nature, for the overland journey was then possible.

In the 1914 epidemic the great amount of traffic up and down the railway construction caused the land quarantine to fail, and South Kedah therefore became infected.

Along the seacoast boats from an infected district must either be denied entrance, or must do five days quarantine before landing cargo or passengers at a healthy place.

(5) *Instruction by Posters and Pamphlets.*—Notices in the colloquial should be posted in all places where people meet, e g., penghulus' houses, police stations, mosques, coffee shops, and on trees, &c.

The attached poster "advice" about cholera, in the drawing up of which I received much assistance from the adviser, Mr. Maxwell, was used in Kedah during the 1914 epidemic. I wrote it originally in Malay, so as to make it as comprehensible as possible, then put it into English, and had Chinese and Tamil translations made by competent translators. The English copy was circulated amongst all Europeans, as was Dr. Gimlette's excellent memorandum on cholera.

The President of the State Council, with the Shaik ul Islam and Chief Kathi, also drew up and issued a Malay notice pointing out that the measures advised by the Medical Department were in accordance with Mohammedan law. This notice was fortified by texts from the Koran and quotations from Mohammedan divines. Through the help of its authors the disinfection of mosque water with potassium permanganate was widely adopted.

(6) *General.*—Assemblages of people must be prevented, if possible. The celebration of festivals is to be discouraged, especially where feasting is involved. Native theatres must be shut. In towns people who feel ill frequently go to lie off in lodging houses, opium divans, or brothels, which must be constantly inspected. Simple living is to be inculcated. The avoidance of alcoholic drinks, unripe fruits and raw vegetables, and indigestible and tinned foods, should be recommended. The subordinate cholera staff should be co-religionists of the people amongst whom they work. The medical officers should know the language, customs, and ideas of the people, and must always respect their religious prejudices. Medical officers can set a good example by drinking permanganated water in the presence of the people, to prove that it is harmless, by taking an active part themselves in disinfection, and by showing sympathy with the sick. The removal of the dead to a distant burial ground must not be allowed. Death registers must be frequently inspected; an undue increase in the death-rate in any makim points to cholera infection. Government officers, especially police and penghulus, who commit breaches of the regulations or connive at concealment of disease, &c., should be severely dealt with. The same rule applies to dwellers in towns generally. In a rural area where concealment of disease is widespread the fining or imprison-

ment of one or two householders may have a good effect, but indiscriminate severity defeats its purpose. Amongst the ignorant more is to be gained by admonishment and advise.

X. *The Quarantine Camp, Alor Star.*

Treatment adopted in it. The quarantine camp, Alor Star, contains one large permanent cement-floored ward with latrines and bath, incinerator, mortuary, &c. When an epidemic occurs, materials are bought and temporary buildings erected by prison labour on cement floors for the housing of contacts, and of dressers, attendants and guards. The nursing, scavenging, and cooking are done by selected prisoners, under the superintendence of dressers.

Treatment.

In the first epidemic I tried elimination. Castor oil was used with some cases, calomel with others. The huge mortality, 68·69 per cent. amongst 135 cases, led me to abandon this treatment.

In the second epidemic, hypodermics of morphia were used; permanganate drinks were given; the mortality was 62·75 per cent. (102 cases).

In the third epidemic, similar lines were followed. Normal saline solution was injected intravenously in a number of cases. It was found that normal saline solutions relieved the painful symptoms, but did not save life. This fact was noted in 1833 by Assistant Surgeon Murray of Meerut, who was probably the first to try this remedy (the mortality was 64 per cent. in 236 cases).

In the fourth and last epidemic, transfusion was not employed in the first 41 cases; of these 16 recovered. Mortality, 60·49 per cent. Transfusion with hypertonic saline solution was used whenever indicated amongst the next 192 cases; of these 104 recovered, and 88 died. Mortality, 46 per cent. During the recrudescence in June it was used amongst a further 45 cases, of whom 23 died; mortality 51 per cent. The mortality amongst the whole 278 cases in the quarantine camp was 48·92 per cent. Hypertonic transfusion therefore gives much better results than any other line of treatment. This was especially noticeable amongst the 23 prisoners who got cholera. Most of them were previously healthy, and well fed men. Two were brought in moribund from distant rural sanitary gangs; the others, however, all had early treatment. Nine died, a percentage mortality of 39.

Formerly the percentage mortality amongst prisoners always exceeded fifty. The hypertonic saline solution used was that recommended by Col. Leonard Rogers, I.M.S., in his "Cholera and its treatment, 1912." The indications he gives for its use were followed, except that it was seldom possible to take the specific gravity of blood or to use a sphygmograph to estimate the blood pressure. The amount of work left no time to make these precise tests; besides the quarantine camp was for the greater part of the day in charge of a dresser, who was unable to carry them out. The estimation of the pulse was therefore made by the finger; weak pulse, restlessness, cramps and cyanosis were taken as indications for transfusion. Both intravenous injections in the arm (Rogers' method) and intraperitoneal administration (Bishop's method) were carried out. The intraperitoneal technique is simpler, and less risky; for most dressers it is the only one possible, though two dressers learnt to perform intravenous injections quickly and well. In 33 cases the intravenous method alone was used, in 54 the intraperitoneal. In 56 cases (all injected more than once) both methods were used. The amount given at one injection varied from three to four pints.

The appended table gives certain particulars about the 143 cases injected from January to April, 1914.

A.—TOTAL AMOUNT OF SALINE IN EACH CASE.

Route and mortality.

Number of cases injected	Total pints injected	Route injected			Deaths			Total deaths	Percentage of deaths
		I.V.	I.P.	Mixed	I.V.	I.P.	Mixed		
2	2	1	1	—	1	1	—	2	100
31	3	3	28	—	3	8	—	11	35
20	4	13	7	—	4	2	—	6	30
11	5	2	5	4	2	5	2	9	82
14	6	3	5	6	1	3	3	7	50
18	7	3	1	14	3	—	8	11	61
13	8	6	4	3	3	4	2	9	65
8	9	—	1	7	—	1	4	5	62
11	10	—	1	10	—	1	7	8	73
6	11	2	1	3	2	1	3	6	100
3	12	—	—	3	—	—	2	2	67
2	13	—	—	2	—	—	2	2	100
2	14	—	—	2	—	—	2	2	100
1	15	—	—	1	—	—	1	1	100
1	17	—	—	1	—	—	1	1	100
143	—	33	54	56	19	26	37	82	57

Two persons died after two pints had been injected.

The value of the intraperitoneal route is shown by the fact that it was adopted in 28 out of 31 cases who received three pints, and that the mortality in this section was only 35 per cent., although the three intravenous cases died. Among those who received four pints (13 intravenous and 7 intraperitoneal cases) with the death-rate of 30 per cent., the odds slightly favour the latter route.

It will be gathered from the table that it is useless to give more than three injections (more than twelve pints). In the most desperate cases the patient certainly responds more quickly to intravenous injection; in two very bad cases injected intraperitoneally it was found post-mortem that little fluid had been absorbed. This however was the exception and not the rule. The intestines were never injured in the intraperitoneal method, though at one post-mortem a small puncture was noticed in the great omentum. In one case post-mortem a small localized abscess was found, in another peritonitis was commencing: in both there had probably been an error in sterilization. In one intravenous case, cellulitis of the arm ensued. This may have been due to the low vitality of the tissues, and not to any want in antisepsis at the time of injection.

At no other post-mortems was anything abnormal noted that could have been due to lack of surgical

cleanliness. Where the urine was deficient in the latter stages, small intraperitoneal injections of normal saline solution were sometimes tried, but did not meet with success. They are included among the injections shown in the table. Dry cupping over the kidneys, and high salines were also tried. It is unsafe to carry a patient any distance after a hypertonic injection. Four cases were transfused in the town and then carried three miles to the quarantine camp. Three of them died.

B.

Particulars of 192 cases amongst whom hypertonic injection was used whenever indicated.

	Number of injections							Total
	0	1	2	3	4	5	6	
Number of cases ...	49	54	48	28	9	2	2	192
How many died ...	5	22	27	21	9	1	2	87
Percentage of recovery	88	59	44	25	0	50	0	54%
Complications or terminal causes of death—								
Uræmia	—	3	11	15	7	1	1	38
Collapse	2	14	14	2	1	—	—	33
Diarrhœa	—	3	1	2	—	—	—	6
Cellulitis... ...	—	1	—	—	—	—	—	1
Septicæmia	—	—	—	—	—	—	1	1
Ruptured liver abscess...	—	—	1	—	—	—	—	1
Double pneumonia ...	—	—	—	1	—	—	—	1
Septic broncho-pneumonia ...	1	—	—	—	—	—	—	1
Parenchymatous nephritis ...	—	1	—	—	—	—	—	1
Malaria, comatose ...	1	—	—	1	1	—	—	3
Asthenia	1	—	—	—	—	—	—	1
Perforation, bowel, dysentery ...	1	—	—	—	—	—	—	1
					Total deaths		...	88

Three of the six fatal cases not transfused in this series were complicated by pre-existing diseases, viz., dysentery 1, broncho-pneumonia 1, malaria 1. Altogether 3 malarial cases (all subtertian) from the waterworks construction, developed cholera; all died. Six men, 5·4 per cent. of total deaths, died of a late terminal diarrhœa, and one of broncho-pneumonia, which was probably due to infection of the lung by the cholera vibrio. One man was found to have a ruptured liver abscess. 38 deaths (43 per cent.) were due to uræmia, and 33 (37·5) to collapse. This is exactly the reverse of what one finds in a series of cases where saline transfusion is not used. For instance, out of 25 deaths amongst the first 41 cases not transfused, 20 deaths (30 per cent. of the total) were due to collapse, and only 4 (16 per cent.) to uræmia.

This means that a considerable proportion of those who are tided over the collapse stage by transfusions succumb to uræmia later on. In my opinion some of these deatbs are due to the hypodermic use of vasoconstricting drugs, such as digitalin, adrenalin and pituitrin, which have lately been strongly recommended in cholera. Their use was abandoned towards the close of the epidemic. In some cases of suppression 2 gr. doses of sodium nitrate were tried.

I suspect that the hypertonic saline injection at times aggravates the tendency to uræmia. In two of the first series of cases which were not transfused there was almost complete suppression of urine for five days. No vasoconstricting hypodermics were used. Rectal injections of 4 oz. normal saline solution were given every four hours. Both recovered. I saw no recovery amongst any very severe cases of uræmia that had been transfused (even though normal saline per rectum was tried). Three of the men who died of uræmia were found post mortem to be suffering from advanced interstitial nephritis. Where stimulation was necessary, æther was injected hypodermically. Strychnine was to a lesser extent injected. Potassium permanganate tabloids (2 gr.) were given to all patients, as many as 30 were administered on the first day, and ten on subsequent days up to one week. After active symptoms subsided, if troublesome diarrhœa continued, bismuth salicyl was found useful. No morphia or opium was used, and no alcohol.

In some cases which were mild when admitted, one or two doses of an astringent diarrhœa mixture were given. Most of them did not become severe. The diet followed was that recommended in section 21 of the attached circular.

Three of the admissions early in the epidemic passed porridgy stools, and never had rice-water motions: yet they exhibited great collapse, and all died.

The liability of new comers to contract cholera was sbown by the admission of four persons, from Penang, who had been four days or less in Alor Star. Three of them died.

Cholera superimposed on antecedent bowel disease is usually hopeless. The prognosis is bad for opium smokers also. Amongst sequelæ paresis chiefly affecting the lower limbs was noticed in two cases. In one, who developed melancholia in addition, it persisted for nine months.

The stool of every case admitted to the quarantine camp was examined for cholera vibrios. The stools of contacts were also periodically examined; many in whom no symptoms developed were found to contain vibrios. The stools of all convalescent patients were examined weekly, and they were not discharged until vibrios were absent. This entails a much longer detention in camp. One who had a mild attack still continued to pass vibrios 67 days after admission. Post-mortems were held in the majority of cases. Dr. Smart took special interest in this work. Bile from a number of gall-bladders was sent by him to Singapore, and examined by Dr. G. A. Finlayson, to whom hearty thanks are due. He found cholera vibrios in about one quarter of the specimens sent.

During the cholera recrudescence in June, two Chinese coolies from the town were admitted to the camp, who had passed through typical attacks less than four months previously. Cultures from their stools were sent to Dr. Finlayson, Singapore, who pronounced one case to be true cholera (he died), but was doubtful about the other. This proves that the protection conferred by an attack of cholera is very short. Dr. Stanton suggests that a prophylactic cholera vaccine be tried should a cholera epidemic again occur here. Several Europeans developed

cholera in 1914. They were probably infected by the substitution of river water for rain water in the club by a boy. Four had severe attacks; of these, two died.

XI.—*Percentage mortality from cholera amongst the cases reported in four Kedah cholera epidemics.*

A.D.	Cases reported	Percentage death-rate on total cases reported	Percentage death-rate on cases treated in Alor Star quarantine camp
1907 ...	330 ...	74·8 ...	68·80
1908 ...	686 ...	79·9 ...	62·75
1911 ...	1,211 ...	79·7 ...	64·00
1914 ...	2,266 ...	68 8 ...	48·92

Details of reported cases 1332 *A.H.*, 1914 *A.D. epidemic.*

	Cases	Deaths	Percentage Mortality
North Kedah—			
Treated in quarantine camp, December—April	233 ...	113 ...	48·4
Treated in quarantine camp, June	45 ...	23 ...	51·1
Treated at home or untreated, December—April	1,515 ...	1,064 ...	70.2
Treated at home or untreated, June	25 ...	20 ...	80·0
Kuala Muda	205 ...	151 ...	73·6
Baling	243 ...	174 ...	71·6
Total	2,266	1,545	68·18

XII.

The total extra cost of the 1914 cholera epidemic to Kedah (paid for from a special vote) amounted to $41,043.38.

The chief items were:—

Purchase of water from Penang, including pumping and distribution	$12,711.48
Disinfectants and medicines	8,841.52
Pay of extra medical officers	2,952.46
,, ,, dressers and sanitary tindals... ...	3,868.90
Travelling of M.O's., dressers, and sanitary parties	2,557.57
Cholera gratuities to subordidates	1,399.41
Material for temporary building at Quarantine Camp, Alor Star	791.40
Diets, Quarantine Camp, Alor Star	3,346.01
Firewood (including cremations) and oil, Quarantine Camp, Alor Star	2,125.68
Clothing, mats, utensils, blankets for Quarantine Camp	1,305.66
Compensation, Alor Star	283.12
Printing of notices, advertisements, and payment for translations	285.35
Payments in Kuala Muda district	1,012.11
,, Baling district	993.71
,, Yen ,, ...	190.00
Total ...	$41,043.38

The last three items were bills for compensation, firewood, special guards, temporary bills, &c., mostly on signatures of the European police officers, South Kedah.

The average daily number (excluding fractions) dieted in the Alor Star Quarantine Camp for seven months was 93.

Approximate cost of diet per head daily, 17 cents.

One Straits dollar = 2s. 4d.

XIII. *Results Obtained and Outlook for the Future.*

The results obtained within the Sanitary Board area, Alor Star, in the last epidemic are encouraging. With a makeshift supply of drinking water, and with no bathing water except the deeply infected river, the cases averaged only one per day (amongst 10,000 people). Since its close waterworks and pipe lines have been finished, and Alor Star is provided with a permanent pure water supply. The Sanitary Board is efficient, the disinfection and removal of nightsoil is thorough, and the river bordering the town is no longer used as a latrine.

Should cases of cholera occur in the future, it is therefore possible that they may be stamped out before the country becomes infected. It must be admitted, however, that the immediate results in rural areas are disappointing, and disproportionate to the work done and money spent. Little active opposition is now met, and the disinfection of wells and houses is not objected to. Even women occasionally ask for the obat merah (pot. permang.) and put it in their wells themselves, although a few years back all disinfectants were regarded as poisons. But this does not get to the root of the trouble. Most natives still fail to realize the infectivity of cholera excreta, and regard our statements as romances. Generations of riverine dwellers have defæcated in the river. Why, they argue, should they cease to do so? The immediate disinfection of all stools, or instant burial where disinfection is not possible, though strongly insisted on, is rarely carried out, unless a sanitary party is present.

The isolation of patients in rural districts is another difficult problem. Asiatics have always been used to visit their sick friends, and consider our restrictions inhuman. Until the ryots realize the danger of their habits and are willing themselves to co-operate with the Government, the stamping out of rural cholera, once a few cases have developed, will always be a very uphill task. Much of the pioneer work that has been done will, it is hoped, bear fruit among the rising generation.

XIV. *Spread of the Disease. Localities Affected.*

(1) *Alor Star.*—The first case occurred in a toddy shop in Jalan Penjara Lama: the man had not been out of Alor Star for months; he and the contacts were removed, the toddy in stock destroyed, and the shop disinfected and closed.

Three other cases during the first week were proved to have drunk toddy at this shop. In five months, December to April, there were only 182 cases in Alor Star (estimated population 10,000), or an average of little more than one daily. During the cholera recrudescence in June, 70 cases were reported in North Kedah, half of them in Alor Star.

(2) *Kuala Kedah and the coast southward.*—Within two days after the first Alor Star case, a fisherman at Kuala Kedah, who had recently visited Alor Star, but not the toddy shop, developed cholera and died. Other cases then followed in the Malay theatre at the Kuala. Thence Kuala Salak on the coast ten miles south of Kuala Kedah, became infected in December, free in January, but again infected in February. Sungei Limau, sixteen miles south, after one case, remained free until March, when many deaths occurred there, and at Dulang and Yen. The island of Pulau Bidan was also infected in March;

the disease was then brought to Penang Island by runaway fishermen.

(3) *Places around Gunong Griang (and the coast northward from Kuala Kedah.)*—All the mukims around Gunong Griang became badly infected in January; most of the kampongs are situated on small stagnant streams, in which the water is vile in the dry season.

(4) *From Alor Star north to the Siamese frontier* 306 cases were returned. Included in this return were 21 prisoners, and 16 hospital patients, 10 of the latter only were in hospital a few hours, having entered just before active cholera symptoms developed. During the recrudescence of cholera in June two more prisoners were attacked; one died.

(5) *Langgar road and mukims round Langgar.*—As usual there was a heavy incidence in Langgar village and the surrounding kampongs, situated as they are on stagnant streams from which they take their water supply; there were 90 deaths in the mukim of Langgar alone.

(6) *Along the Sungei Korok Canal.*—The disease, as usual, made no headway along the Sungei Korok after reaching Kota Sarong Semut. A few cases occurred at Padang Lumut and Gurun, but Semiling and Sungei Patani were skipped entirely. The soil here is laterite.

(7) *Along the railway between Alor Star and Gurun* 44 railway coolies were attacked, of whom 21 recovered. The Malay kampong at Tokai was infected from the railway in March, and 29 cases resulted in it. During the recrudescence in June, six more Alor Star railway coolies got the disease.

(8) *Kuala Muda District, South Kedah*, remained free until February, but in that month and March 205 cases were repocted there.

(9) *In Baling, upstream from Kuala Muda*, 243 cases were returned between February and April. A few also occurred late in June. The majority of Baling cases were never reported. Through lack of staff and difficult communications, very little could be done in this district. Two police officers, Mr. Speers and Mr. Gilroy, visited it, and the latter remained there for nearly three weeks with a temporary dresser.

Note.

Upstream Spread of Cholera.—The note by Dr. Hoops in his most valuable article (which may well stand as an authoritative contribution) on cholera in this issue of the Journal, mentions a point of interest and importance. The writer, from experiences gained on the Cholera Commission sent to Egypt in 1883, of which he was a member, drew attention to the fact that cholera appeared in that year at the Damietta mouth of the Nile where it falls into the Mediterranean. The disease spread from thence to the spot where the Nile divides into the Damietta and Rosetta branches. The infection spread from thence up the main river; town after town and district after district were attacked, until the track of the infection was lost somewhere about the Dongola district. The towns in the Rosetta branch and in the Delta were irregularly attacked, showing overland infection in all probability. The writer ascribed the upstream infectiou to fish, but he has not had the opportunity of investigating this supposition. Perhaps Dr. Hoops would take up this question if he has the opportunity.

J. CANTLIE.

Notices.

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THE JOURNAL OF

Tropical Medicine and Hygiene

AUGUST 2, 1920.

THE ROYAL SOCIETY OF TROPICAL MEDICINE AND HYGIENE.

THE term "Royal" prefixed to the Society of Tropical Medicine is one which becomes the sovereign who bestowed it, and the subject which

the Society deals with. On no society of so short an existence has the term been so speedily bestowed; for it seems but yesterday that Sir James Cantlie called some half-dozen of the best known tropical men to his house in Harley Street, and laid his scheme before them. He had the scheme formulated, a set of rules for the society drawn up, the names for a Council and Executive Committee set out, and even the names of the officers already on paper. The President he named was Sir Patrick Manson, the Secretary Dr. Carnegie Brown, and the Treasurer Dr. William Hartigan. Manson and Hartigan were his old colleagues in Hong-Kong, and Brown the first doctor he met in the Tropics when he called at Penang on his way to the Far East. The scheme, the rules, and the officers were practically accepted as they stood, when some months afterwards a meeting was called of all those interested in tropical medicine, which met at the Colonial Office by the kind permission of the authorities. The Society has flourished; it was welcomed all over the world by Britons and scientific men of every nationality. By quiet and earnest work the Society has grown in numbers and in importance. Its Presidents have been men of importance and renown, bearing names which will be handed down as the fathers and founders of tropical medicine. Manson, Ross, Leishman, Charles, Sandwith, Bruce and Simpson have held the position of Presidents. They need no initials to differentiate them, neither prefixes nor suffixes to distinguish them, for their names are engraven deeply on the tablets of all men's memories. In the early days we smiled—nay, laughed in derision when the founder of the Society in his enthusiasm sketched the future of the Society in glowing terms, ending up with the prophecy that it would become all-powerful in the world of tropical medicine, and that it was only a question of time before it would be known as the Royal Society of Tropical Medicine and Hygiene. The success of the Society, owing to the paucity of men at home who could attend the meetings, was doubted in several quarters. The devotion, however, of these few to the subject which the Society had made its own gradually began to tell, and in no long space of time the list of members grew to ample proportions. The officers in the Navy and in the Army (Indian and Home) were a welcome accession to the Society, for in both these Services the lethargy of previous days was set aside, and there arose a group of men, in the medical department of both these great public services, endowed with the instinct of research and the capability of carrying out investigations in a manner at once scientific and fruitful. The Tropical Society, moreover, brought the officers of the Navy and Army into intimate association with their civilian brethren. Far too long cut adrift from each other by the exigencies of service, the military and civil medical men had no common ground in which to meet; they knew little of each other, and there was no interest to draw them together. In the sphere of tropical medicine, however, a basis was provided; the Society has served as a means of furthering acquaintanceship between men hitherto kept unfortunately asunder for want of a common meeting ground. The civilians must remember that through the great school at Netley the medical department of the Army kept alive the study of tropical diseases. In civil life nothing was being done; the medical men going out to the Tropics for practice in civil life had no instruction in tropical disease. There was no school corresponding to Netley for them. They learned their lessons in the hard school of bitter experience; bitter for themselves and for their patients. Had Netley been open to them how different would have been the story. The teaching then could not, of course, be considered as excellent as to-day, but it was proportionately as good as our practitioners in civil life at home were given at that time. We owe a great deal to the men at Netley—Fayrer, McLean, Longmore, McLeod, and to many others—for the systematized teaching in tropical ailments they afforded. The generation coming after them has continued in the forefront of medical science. We have but to mention Ross, Bruce, Leishman, Rogers, James, Giles, Lewis (of filaria renown), and a host of others as evidence of what old students of Netley and the Royal Army Medical College, London, have accomplished. The military and the civil branches of medicine have come to respect each other, and through the Society of Tropical Medicine and Hygiene they have become better acquainted and united. Their efforts have advanced the study of disease in the Tropics by leaps and bounds. In hygiene the civilians yield the palm to the military, for Parke stands forth as the greatest of all names in modern hygiene unapproached and unapproachable. We have to go back to Moses to find even a parallel to this great military hygienist. In the present President of the Society of Tropical Medicine and Hygiene, Professor J. W. R. Simpson, we have a worthy civilian successor to Parke. It was a wise move of the Founder of the Society to tack the word Hygiene to the name of the Society, and we must not forget that it was under the ægis of our present President that the word Royal was added to the designation of the Society. At present the Society has no permanent home of its own; that must and will come about in the course of time; and that the Royal Society of Tropical Medicine and Hygiene will continue to flourish in usefulness and importance in the future is certain. With its maintenance and development the future of our Empire is linked up. It is playing a great part in the bearing of the "white man's burden," and thereby fulfilling an imperial need of vital importance.

Abstract.

THE LESIONS IN WOOD ALCOHOL POISONING.[1]

By Charles Norris, M.D., New York.

Methyl alcohol attacks the most highly differentiated nerve elements, inducing a deep and prolonged coma and blindness, and it has a marked selective affinity for the most highly differentiated nerve elements in man, which are therefore more rapidly and severely damaged than those of the monkey. Whereas drunkenness in man from grain alcohol is easily recovered from, it is almost uniformly fatal when due to methyl alcohol.

The toxic action of this alcohol is best demonstrated by Birch-Hirschfeld, who states that methyl alcohol is capable of injuring the eye more severely than ethyl alcohol, and that blindness ensues after the acute intoxication and even after very small doses, a result which does not occur with grain alcohol. The cumulative effects of wood alcohol poisoning are striking. Extensive fatty degeneration of the liver was always present in animals which had received daily small doses, the animals remaining comatose for days and refusing to eat.

The reason for the differences in effects on the animal organism between the two alcohols is explained by the difficulty which the organism experiences in oxidizing methyl alcohol; whereas ethyl alcohol is rapidly split into harmless end products (carbonic oxide and water), methyl alcohol is slowly and partially oxidized in the body and is split into substances which are in themselves more toxic than the methyl alcohol—namely, formaldehyde and formic acid. The formic acid is excreted and found in the urine. According to Pohl, the acid is excreted slowly; the maximum amount in the urine did not appear until the fourth day after an initial dose and even when small quantities are administered to animals, formic acid is still found, showing how difficult it is for the body to oxidize completely methyl alcohol. The protective mechanism of the body to wood alcohol is overwhelmed, and we have the curious anomaly of the conversion of one poison into another many times more toxic. It is believed that formaldehyde may be the intermediate product in the conversion of methyl into formic acid, and that if it is, it becomes rapidly converted into its acid. It has been estimated that formaldehyde is thirty times as toxic as methyl alcohol, and Mayer has found that formic acid is approximately six times as toxic—namely, one hundred and twenty-five hundredths grammes to the kilogram was fatal to rabbits in an hour and ten minutes.

Bongers states that methyl alcohol, unlike ethyl alcohol, is found in the urine in large amounts. The slow excretion of the alcohol and of its oxidation products accounts for the long continued effects observed in acute poisoning and for its selective action on the retinal elements and the optic nerves. Bongers furthermore observed that, as in the case of many other poisons, such as morphine and bichloride of mercury, methyl alcohol is excreted into the stomach, where it acts as an irritant to the intestinal tract.

The gross pathology of methyl alcohol poisoning is indefinite. General visceral congestion is the only constant finding in acute methyl alcohol poisoning. Many authorities have emphasized the presence of petechial hæmorrhages in the various viscera, especially in the lungs. Strassman has noted the contractures of loops of the small intestines in a number of patients who were examined in the municipal lodging house catastrophe in Berlin during the Christmas celebrations in 1912, and has called attention to the fact that it may account for the acute abdominal distress which is present so frequently in cases of acute poisoning. None of our cases have shown this condition. The hæmorrhages so largely emphasized, except those of the gastro-intestinal tract, in my opinion, are probably asphyxial and terminal in origin, and therefore are largely determined by the manner of death. One would expect to find them most pronounced and marked in the patients dying of a slow asphyxia. In the Fulton Street cases all the victims (middle-aged men) had marked chronic visceral lesions, such as adhesive pericarditis, wet brain, chronic visceral nephritis and arteriosclerosis, and they all belonged to that period of life in which such lesions are consistently present.

In cases coming to autopsy without a clinical history, and where the surrounding circumstances throw no light on the cause of death, the diagnosis of wood alcohol poisoning may not be made until chemical analysis shows the presence of this alcohol. Frequently it is difficult for us to determine the exact extent or relation to the cause of death which the methyl alcohol has played. I refer to a class of cases in which very large amounts of ethyl alcohol are found with mere traces of methyl. I feel that I must emphasize this point for the reason that it is by means of such cases that the inference may be justified that much of the grain alcohol sold since prohibition has contained methyl alcohol.

In regard to the microscopic changes which we have found in our cases, I am at the present time, unfortunately, not able to give definite information. There are two reasons for this: First, on account of the lack of help and press of work we have not been able to examine our material thoroughly; secondly, much of the material is poorly preserved for microscopic purposes. I may say, however, that the sections of the optic and other nerves that we have thus far examined are unsatisfactory. The changes are so slight, when compared with a normal nerve, that at the present time nothing further may be stated. I realize that this phase of the subject is of the utmost interest and importance.

[1] The *New York Medical Journal*, vol. cxi., No. 14, Whole No. 2157. April 3, 1920. Page 583.

Original Communication.

A CASE OF UNDULANT FEVER WITH UNUSUAL NERVE SEQUELÆ.

By Surgeon Rear-Admiral P. W. Bassett-Smith, C.B. C.M.G., F.R.C.S., F.R.C.P., R.N.

One of the most noticeable Naval medical features of the past war, when such large numbers of men were employed in the Mediterranean, has been the extraordinarily few cases of undulant or so-called Malta fever admitted for treatment. Whereas twenty years ago the hospital at Malta would have been crowded with these cases, during the years 1914-1918 there was a total of only fifty-seven; of these six were French, eighteen Maltese, and thirty-three British ratings.

This happy result is due to the precise knowledge gained by a scientific Commission as to the etiological and epidemiological characters of the disease and the enforcement of the preventive measures recommended; the chief feature of these latter consisted in the use only of preserved or thoroughly sterilized fresh milk both ashore and afloat.

Of the few cases which were sent to England and came under my care at the Seamen's Hospital, Greenwich, the following was of particular interest:—

History.—The onset of the disease was in the Adriatic in May, 1919. He rarely went ashore, and stated that he did not drink any milk. After two months he was invalided convalescent to England, and in the fourth month (September) was admitted to Greenwich, a typical case of chronic undulant fever. There was a history of long, irregular, undulatory pyrexia, early arthritic attacks, with constipation, sweats and increasing debility. He now felt and looked almost well. There were no subjective symptoms, but objective signs were abundant; slight irregular temperature, 99·4; pulse 100 and easily increased; heart excitable; impulse diffused; tongue large, flabby and indented by all the teeth, high degree of blood agglutination with *M. melitensis* to a titre 1/2000. There was a secondary anæmia with low polymorphonuclears (30 per cent.) and high lymphocyte count (56·7 per cent.), the clinical features indicating a persistent melitensis toxæmia and probable relapses.

He was treated with arsenic, iron, yeast and good nourishing diet, and a course of sensitized melitensis vaccine (1 c.c. every fifth day = 300 million) was commenced early. At the beginning of October there was a fresh pyrexial attack associated with a vesicular eruption on the right side, extending downwards to the knee over an area supplied by the fourth and fifth lumbar nerves, pain was moderate, reflexes were increased, and as the eruption dried some desquamation and loss of sensation ensued. This continued for about three weeks, and was followed by an apyretic interval. Subsequently several abortive waves occurred with slight neuritis and a sharp attack in December (eighth month), associated this time with acute right orchitis. A freshly prepared non-sensitized vaccine was now given and the patient steadily progressed; ten months after admission he was discharged, apparently convalescent. Throughout the agglutination titre was high (1,000 or more), no doubt partly due to the vaccine treatment, and the relative count still remained very abnormal with 40 to 56 per cent. of lymphocytes. It is the first case I have seen, and I cannot find any previous record of one of herpes zoster as a complication of undulant fever, in this instance implicating the posterior root ganglia of the fourth and fifth lumbar nerves. Though the evidence of the specific toxin was so abundant, the organism could not be isolated from the blood or urine.

With regard to treatment, the administration of yeast, though well tolerated, did not appear to influence the blood count, neither did the sensitized vaccine prevent relapses, but under a course of freshly prepared ordinary melitensis vaccine improvement was marked.

A further interesting case has recently been under my care in the Seamen's Hospital. The patient was admitted for undulant fever contracted in the Mediterranean during 1915. He was quite convalescent, but his serum was found to agglutinate with *M. melitensis* to a titre of 1/200 and to *M. paramelitensis* to 1/2,500. An absorption test showed the case to be a true paramelitensis infection; it is the first recorded in the Naval service.

SPRUE IN AMERICA.

By Edward J. Wood, B.Sc., M.D., D.T.M. (Eng.)

Tropical sprue was described by Hillary in Barbadoes as early as 1776. There has always been a question whether this disease in the western hemisphere was the same as sprue of the East. It will be recalled that Sir Patrick Manson regarded it as true sprue, while, on the other hand, Carnegie Brown says only in tropical and sub-tropical eastern Asia can the disease be found. It may be on account of this declaration of the latter observer that the disease is being so generally overlooked in America.

After seeing numerous cases of what I regarded as sprue, I was desirous of determining for myself whether or not there was any real difference between the two conditions. In London at the Tropical School it has been my privilege to see the disease from the East diagnosed by men whose experience in the eastern tropics made their opinions all that the critical could demand. A careful observation of the cases in London shows conclusively that there is no difference in the condition of the West and of the East. In both regions the characteristic signs of the disease are the same. The diarrhœa was found to differ none at all, manifesting itself in large, light-coloured motions, which were acid in reaction and passed chiefly in the early hours of the

day. The tongue of the cases I have seen in London was the same as the tongue of my American cases. From reading the literature of eastern cases, I had expected to see in the tongue the point of distinction if there was any. It was surprising to see in these eastern cases in London no more severe mouth symptoms. This fact seems to justify the suspicion that frequently the literature over-emphasizes the tongue symptoms which, in a large proportion of the cases under my observation, are quite secondary to intestinal and blood symptoms. It is altogether probable that a larger number of observations would have demonstrated many with a more severe glossitis than I have recorded. The general opinion prevails with us in America who have studied sprue that in the eastern disease the tongue symptoms are more exaggerated. It would not be amiss, therefore, to point out to the observer seeing his first cases that there may be all degrees of tongue involvement.

The anæmia in sprue is more characteristic than is usually regarded. The general opinion seems to be that it is of the secondary order and there is no evidence presented to the contrary, but it is a notable fact that the colour index, especially in the advanced stages, is above one: that is, on the pernicious anæmia side. This fact is likely to be in the future, as I have suspected in the past, a source of error in diagnosis, for there are a number of points in sprue strongly suggesting pernicious anæmia. I have seen grave cases with high colour index, comparatively trivial tongue symptoms, and the usual diarrhœa, together with great chronicity and a marked tendency to remission. It will be recalled that Hunter mentions mouth symptoms in pernicious anæmia. One of my patients with sprue had been deprived of all her teeth in the hope of relieving the condition which was not recognized as sprue. In sprue I have found a dearth of nucleated red cells, though the colour index was high, but this does not seem to be the universal experience.

The remissions of sprue much simulate those of pernicious anæmia. This has probably resulted in a faulty conception of the curative value of many therapeutic procedures, for in both diseases the symptoms at certain times tend to abate without treatment or in spite of it.

American cases of sprue have been chiefly confused with pellagra. This source of error is especially unfortunate as it is not justifiable, though many who have the right to speak with authority still regard a differentiation as difficult in some cases. The question can be readily settled by a study of the utilization of fat. In sprue, as was shown by J. H. Pratt, there is a marked loss of fat in the stool and also an increase in nitrogen loss. Pratt used a modified Schmidt-Strassburger three day test diet. The fæces was collected and the amount of the extracted fat compared with the original fat of the food. This same line of investigation was done for me by Captain Geo. F. Catlett (U.S.A.) in my pellagra cases, and it was shown that in this condition there was not present this great fat loss nor was the nitrogen loss so marked. In sprue, Pratt and Spooner found pancreatic insufficiency which was indicated by the Einhorn-Schmidt thymus test and the Sahli glutoid capsule salol test. It will be recalled that Manson-Bahr in his Ceylon cases found that the fat absorption ranged from 70 to 90 per cent. In the American cases this was often exceeded.

In addition to these differences there are many other points of distinction between pellagra and sprue. In pellagra there is a marked macroscopic difference in the stools, as the colour, consistency, reaction and time of passage differ widely. In sprue the anæmia is a marked feature while in pellagra it is quite inconspicuous. The nervous features usually occur early enough in the course of pellagra to make a point of great practical importance. The seasonal incidence of the outbreak of pellagra which is so definite is another helpful point in differentiating. The final test should be the absolutely characteristic skin lesion of pellagra. It is seldom if ever justifiable to diagnose pellagra without this symptom or a satisfactory history of its past occurrence.

The tongue differs markedly in sprue and pellagra. But there are typical cases especially of a mild type in which the differences are not notable. As a general rule I have found that in pellagra the colour of the tongue is a deeper hue than in sprue. In pellagra the tongue is more pointed and less flabby than in sprue. In pellagra, salivation is often a most distressing feature, while in sprue if it occurs at all it is of comparatively trivial nature. In sprue I have never seen salivation, though some writers have recorded it. It would be helpful if information were forthcoming on this point. My own observation would make it a point of helpful differentiation. Crombie's molar ulcers have been described in sprue, but also occur in pellagra. It is not infrequent to see a line of ulceration extending almost completely around the free edges of the tongue. In cases of pellagra with salivation the odour of the mouth is exceedingly offensive. The pain in the mouth and œsophagus in pellagra is much greater than in sprue, though in the latter it is often distressing. The ulceration of the papillæ of the tongue in sprue must be considered in a differentiation as it is infrequent in pellagra according to my experience.

One of the sources of error in the recognition of sprue is chronic pancreatitis. As above indicated, there occur in sprue evidences of pancreatic inactivity. It will be remembered that in 1907 Mayo Robson reported the finding of chronic inflammatory changes in the pancreas in cases diagnosed as sprue, and stated further that in other instances sprue was complicated by pancreatitis. In numerous post-mortem examinations in sprue there has been observed an atrophic condition of the pancreas. One of the much needed contributions to the knowledge of sprue should be on the relationship of the pancreas. Whether pancreatic changes are result or cause of sprue needs to be determined. It is interesting to record here a personal communication from Dr. Pratt on a case of sprue in which he did not find pancreatic insufficiency but a fat loss of 59 per cent. Before determining finally the part played by the pancreas in this problem,

we must not lose sight of the possibility of the duodenum being a factor of importance.

The distribution of sprue in America is a matter of considerable interest and importance. Until more interest is aroused and the diagnosis is more generally made, no statistical data can be had. In North Carolina where my observations were made, it was found through a discussion in the State Medical Society that the disease was by no means a rarity nor a recent addition. There is evidence of it in the States of Virginia and Georgia also. One of my cases came from near Boston. This patient had not been in the tropics or sub-tropics in twenty-five years and the case was absolutely characteristic. This patient had reached a lower physical point than any case I have seen in London, but a recent letter from America states that he is perfectly well after several years of diet battle. In this case the strawberry played an important therapeutic part. I am told that in California the strawberry has proven a valuable therapeutic test in the diagnosis.

It cannot be too strongly emphasized that sprue, like so many other conditions, may occur beyond even the sub-tropics, and should be more generally had in mind, especially in cases with anæmia and diarrhœa to which may be added sore tongue, even though trifling in character.

It is reasonable to presume that sprue will be generally recognized in America, and the number of diagnoses will increase with an increase in interest in tropical medicine.

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THE JOURNAL OF

Tropical Medicine and Hygiene

AUGUST 16, 1920.

REFLECTIONS ON SOME AILMENTS IN THEIR TEMPERATE AND TROPICAL ENVIRONMENT.

RHEUMATISM.

THE very mention of rheumatism as a subject for discussion is one calculated to at once lessen interest and to check enthusiasm on the part of

the investigator and the practitioner of medicine. The definition of the disease is as impossible as its treatment, and it therefore opens wide the portals for the entrance of the theorist and the quack. The multitude of names assigned to the several forms of the malady is evidence of the hopelessness of inexactitude which surrounds the subject and the empiricism which attends its treatment. Tropical medicine has not helped us in this direction as it has in so many others, and we know but little of the disease in the tropics. Few writers on tropical medicine deal with it; even in the encyclopædic volume by Castellani and Chalmers rheumatism in any one of its hydra-like forms is only mentioned in a general way; and although the disease has been found in animals in the form of rheumatoid changes in the bones entering into the joints of animals, showing its prevalence in periods long antecedent to the appearance of man upon the earth, our advance in knowledge is clinical merely, and yet the amount of knowledge in this sphere is infinitesimal and unsatisfactory. The root of the term rheumatism is "associated" with the word rheum, derived from the Greek word ῥεῦμα = flux, stated to mean any watery or catarrhal discharge, but as rheumatism in any form is seldom associated with a discharge in the common acceptance of the term, confusion and not elucidation is added thereby. The Latin and Greek synonyms are the mere dialectic equivalents of the modern name, and in no way help us to determine any reason for the adoption of the name. Yet the disease perhaps of all diseases the most widespread in the world has not advanced with modern science in accordance with other branches of medicine. It is extraordinary that this ailment which is on every lip has been allowed to be side-tracked by investigators who seem contented to allow it to occupy an unexploited region in the great field of disease. Are rheumatism and rheumatoid ailments, be they of joints, bones, muscles, viscera or connective tissues, generally to be allowed to defy man in future as they have done during the ages, or are we to take up the cudgels to tackle this, one of man's greatest detriments to health? Can tropical men help us? It is not an inviting field for research; the disease is commonplace, and neither the pathologist nor the bacteriologist have helped us in any but to an infinitesimal extent. Several varieties come before. Amongst these we may mention rheumatic fever. Is it prevalent within the tropical zone? This is readily answered, and a definite "No, it is not," is forthcoming. That fact has only been established of late years. The writer brought the subject before the Royal Society of Tropical Medicine and Hygiene a short time ago, whilst dealing with the subject of the absence of certain well-known diseases of temperate climates not met with in the tropics. The writer, whilst analysing several annual medical reports of tropical countries, found rheumatic fever included in the list of recorded ailments dealt with. The medical officers of the tropical countries thus mentioned happened to be present, and stated that this was a false statement, and explained that in drawing up these reports several native medical officers, unacquainted with the British meaniug of rheumatic fever, had called cases of fever associated with muscular (rheumatic) pains (and undoubtedly put these down as) rheumatic fever. We may therefore state definitely that acute rheumatism, or rheumatic fever as it is known in Britain, is not met with in the tropics. A further note may be appended to this, viz., that persons who have had rheumatic fever in Britain, and who subsequently to the attack have taken up residence in the tropics, very rarely have a recurrent attack. The absence of this recurrence is worthy of careful notice; is it the hot climate alone that kills out the disease, be the origin what it may, or is it some cause independent of heat and due to environment in some other form? The tendency in this country is for a recurrence to take place—in the tropics it is not so; and here a wide field of research is open to investigators to determine what part heat plays, if any, in this marked phenomenon. Speculation in the matter will be rife, and if heat is proved to be the cause of the disappearance of the disease, then a help towards treatment is at once brought about and advanced. The basis, however, for real advance is not yet made. The etiology of rheumatism in any form is not known; and until that is discovered we are practically at a standstill. Our chief cause for valvular disease of the heart is, we may say, undoubtedly rheumatic fever. The suggestion then presents itself. Given the absence of rheumatic fever in the tropical zone, what are the chief causes of valvular disease in young (native) people in the tropics? Do they suffer widely from "heart disease" of the kind? If so, to what is this ascribed? We confess our knowledge on this subject is limited, and we should welcome information on the point; it is a subject everyone in practice in the tropics can assist in elucidating, and it is to be hoped it will be done.

Rheumatoid arthritis, a disease so common in England and in most parts of Britain that few escape it in old age, has again to be considered as regards its prevalence. Do the Chinese, Indians, &c., suffer from the disease as do we at home? Do we see the bent-backed, stiff-jointed, swollen-knuckled, hirpling old people in tropical countries we meet with in our villages? "Ould Jarge" is the type of old-age villagers in England. It is put down to beer drinking—probably a totally wrong idea. We get it in the well-to-do, who seldom or never touch beer; the lady may not be able to get her rings off her swollen finger joints without a deal of pain and trouble.

In her and in her class it is usually put down to gout, also an error in all likelihood; and but another camouflage to hide ignorance in regard to the elusive borderland between gout and rheumatism, and so forth. The evidences of ignorance are plentiful, the evidence of real knowledge in this subject practically *nil*. When is this well-nigh universal ail-

ment to be dealt with? It requires scientific handling, and the geographical distribution of the disease is the first line of attack to follow, not only the distribution as to climatic zones, but even to districts in the homeland and the effects of soil, environment, food and drink. Is it favoured or otherwise by beer, wine, or spirit drinking; is it more prevalent in clay or gravelly soil? Even these are not settled. It is a popular stigma attaching to clay soil, but it is not proved, a mere popular legend as far as proof is concerned, and may turn out to be a wholly fallacious one.

Will tropical practitioners help in this matter not necessarily by way of bacteriology, but by observation in what form rheumatism comes into their practices. We have crushed out our "ordinary" observers by bacteriology. They think that unless it is a new germ or a new insect that they have to report it is not interesting and of little importance to anyone but themselves. It will take some time to eradicate this slavery to the "ologies." The practitioner is the outpost in all our observations in disease, and nothing is more important, none more elucidative than the record of the diseases met with in daily practice, in other words, the geographical distribution of disease.

Medical Notes.

Dr. Guido Cremonese, in a paper on the prevention and treatment of malaria by means of mercurial preparations, states that, some years ago, he noticed that syphilitic patients who had undergone treatment with mercury were apparently immune to malaria and he came, therefore, to the conclusion that mercury might have a preventive and curative action in malaria.

At first he gave mercury by intramuscular injections of a 1 in 1,000 corrosive sublimate solution. Later on he adopted the following pills:—

Mercuric biniodide	...	...	grm. 0·01
Extr. gent. q.s.			

He claims very good results from the administration of these pills both in the prophylaxis and curative treatment of the malady.

As a matter of fact, preparations of mercury were tried in malaria many years ago without any very definite results.

We would also refer our readers to what Sir J. Cantlie styles a modification of the old English pill (or powder) used in chronic malaria and freely used by him to-day.

℞	Quininæ bihydrochloridi	.	...	1¼ gr.
	Acidi arseniosi ...	...	...	$\frac{1}{16}$,,
	Pil. saponis co.	..	...	1½ ,,
	Hydrarg. subchloridi ...	...	...	$\frac{1}{12}$,,

in which small doses of mercury are introduced.

Current Literature.

Bulletin de la Société de Pathologie Exotique. May 12, 1920.

Tuberculosis of the Skull Wall in a Soudanese Negro (F. Noc and A. Esquier).—The case is published as a contribution to the study of infectious lesions of the skull in the natives of West Africa, though the patient was lost sight of before any definite method of treatment could be decided upon. Two painful abscesses were present in the parietal region, one on each side of the head, of the size of an egg and a nut respectively. Puncture produced a clear liquid containing neither bacteria nor parasites, but a guinea-pig which died after inoculation with it showed typical tubercular lesions and Koch's bacillus at autopsy. The possibility of an association of syphilis with the tuberculosis could not be ruled out.

The Herpetomonas and Spirochæta of the Blatta orientalis (A. Laveran and G. Franchini).—In cockroaches taken from Paris bakeries the authors found a very few flagellata of the type previously described by them under the name of *Herpetomonas periplanetæ;* in the digestive tube *spirochæta, gregarina* and *microsporidia* were more common; and bacteria were always present in large quantities. The spirochæte would appear to be a new species, to which the authors give the name of *Spirochæta periplanetæ;* four mice out of five were infected experimentally with the organism, and two of them died within forty-eight hours after inoculation.

An Attempt at Medical Prophylaxis against Sleeping Sickness in Oubangui-Chari (E. Jamot).—With a very limited staff and the barest of equipment, the author succeeded in visiting nearly the whole of a district comprising 100,000 square kilometres in twenty-two months and examining 89,743 natives, 5,347 of whom showed trypanosomata. In certain regions, where the disease had acquired epidemic proportions, the mortality was reduced by 65 per cent., and the virus in circulation by from 54 per cent. to 90 per cent., thus proving that it is not only possible but comparatively easy to combat the infection if properly organized measures be taken. In the author's experience it is quite possible to train natives in the work (both of examination and treatment) sufficiently to enable the assistance of Europeans to be dispensed with for all but supervisory purposes. He considers the most suitable method of prophylaxis to be that of administering injections of atoxyl every two or three months to all infected persons.

Laboratory Methods in the Diagnosis of Sprue (J. Gonzalez-Martinez).—The author recommends the simultaneous use of the culture and complement deviation reaction tests in the diagnosis of all early, incomplete and latent forms of sprue. In ordinary

gelatine *Parasaccharomyces ashfordi* cultures are quite characteristic, and never liquefy the media; they neither coagulate litmus milk nor turn it red, and invariably produce fermentation in maltose broth. In the complement deviation reaction test the author, using warm serum and an emulsion of a six-day-old culture of *Parasaccharomyces ashfordi* in glucose gelose (Sabouraud), obtained a positive reaction in 91·35 per cent. clinically positive cases. All reactions showing an anti-hæmolytic power of less than 25 per cent. were considered as negative.

On the working of a Trypanosomiasis Prophylactic Sector in the French Congo (1919) (A. Piot).—The sector (Ibenga-Motaba) is the first to be organized in accordance with the recommendations of the Sleeping Sickness Commission. The inhabitants have been examined and grouped, and all positive and suspect cases registered. At least one dose of atoxyl has been given to every infected person, and the results have been satisfactory enough to inspire the confidence of the native population, which, having been reduced from 18,000 to 1,000 in the last eleven years, is now fully alive to the danger of the infection.

Experiments in the Auto-haemotherapic Treatment of Blackwater Fever (Henri Fabre).—In Upper Tonkin 3 per cent. of the native troops were attacked by blackwater fever during the last two years, the mortality being about one-third of the cases and the average length of stay in hospital, when recovery took place, six weeks. Treatment with horse serum having reduced this period considerably in one instance, injections of the patients' own blood were tried, with the result that the two cases in which the experiment was made were able to leave hospital in eleven and fourteen days respectively.

Malaria at Casablanca (Morocco) (L. d'Anfreville).—The writer urges the necessity of conducting a more effectively organized campaign than is at present being made against this scourge.

Vaccination against Cattle Plague (H. Schein).—Referring to Dr. Croveri's article in the *Bulletin* for October, 1919, in which he reports unfavourable results from the use of Schein's method of vaccination against cattle plague, the author objects that the experiments were insufficient to justify the conclusion arrived at, especially as there were no controls. "Contrary to the opinion of M. Croveri," he states, "1/1,000 c.c. of virulent blood, injected simultaneously with the serum, appears sufficient, at least in the case of Indo-Chinese cattle, to provoke a reaction strong enough to confer an active and stable immunity; moreover, in the case of buffaloes, which are ultra-sensitive animals, the process is attended by so low a mortality as to in no way prohibit its use.

Abstract.

OBSERVATIONS ON CASES OF SEASONAL HAY FEVER DIAGNOSED AND TREATED WITH POLLEN EXTRACTS.[1]

By Captain W. C. Williams,
Sanitary Corps, United States Army.

During the month of August, 1919, it was decided to make an effort to diagnose and treat autumnal hay fever, with a view to determining the specificity and efficacy of the cutaneous tests for sensitiveness to plant pollens and the amount of relief that could be expected in the treatment of this condition with the extract of the particular pollen responsible for the symptoms.

It was well understood at this time that the opinion of workers in this field was practically unanimous that the greatest relief was to be expected from a prophylactic rather than from a curative standpoint, and that the process of desensitization was more effective when started before the commencement of the hay-fever season than during an attack. It is to be regretted that we were unable to study the preliminary desensitization of any patients, and that the only cases that we saw were those who applied to the attending surgeon for relief after the development of well-marked hay fever symptoms.

Bearing in mind the above facts, the results obtained at the Army Medical School are not to be taken as a final criterion of the value of pollen extracts in the prophylactic desensitization of persons subject to seasonal hay fever, and are presented only as a matter of general interest.

In all cases diagnosed, the simple cutaneous test was used, with pollen extracts obtained from a reliable commercial house. A slight abrasion is made on the flexor surface of the forearm for each pollen to be used and one for a control. These were to be made with an ordinary needle, or with a Von Pirquet borer, the abrasion being not over one-eighth inch in length and preferably not drawing blood. A drop of pollen extract is placed on each abrasion, while the control receives a drop of dilute alcohol in saline. A careful diagram should be made beforehand showing the distribution of the extract to the abrasions. If rapid drying takes place the spot may be moistened with another drop of the extract. In positive cases a distinct reaction takes place usually within ten minutes, and is seldom delayed later than twenty minutes. An urticarial wheal and more or less hyperemia rapidly develops at the site of the abrasion to which has been added the particular pollen to which the patient is sensitive. The control, naturally, shows no wheal and only a slight redness due to the irritation of the scarification. The treatments were carried out with gradual dilutions of the specific pollen extract, as determined by the cutaneous tests.

A total of twenty-nine patients was seen from the time that we were in a position to diagnose, and

[1] Abstracted from the *Military Surgeon*, vol. xlvi, No. 2, February, 1920, p. 199.

make an effort to treat, autumnal hay fever (August 15) until the last patient had cleared up with the advent of cool weather (October 10). Of these twenty-nine people, eight came in for diagnosis only and were not treated, while twenty-one were diagnosed and received a varying number of treatments.

The cases were diagnosed as sensitive to either ragweed or goldenrod pollen as follows:—

Ragweed ...	22 or 81·4	per cent. of cases diagnosed
Goldenrod ...	5 or 18·5	,, ,, ,,
No reaction ..	2	
Total ...	29	

Of the cases failing to give any reaction one cleared up rapidly under treatment for bronchitis, while the other was not heard from again. Both cases were probably "colds" instead of true hay fever.

Ragweed Cases.

The twenty-two cases of ragweed sensitiveness were divided as follows:—

For diagnosis only	6
One or two treatments only	4
Treated cases	12

The cases "for diagnosis only" need no remark, as they merely came in to find out which pollen they were sensitive to. Of the four cases receiving insufficient treatment but one is of interest, the other three being discharged or leaving the city. The one case in this group that is of interest, "Captain X," received a diagnostic skin test on August 25, followed by the smallest injection ordinarily given (0·1 c.c. of a 1 to 10,000 dilution). On August 27 the attending surgeon informed us that the patient claimed to have had an extremely severe reaction, with accentuation of eye and nose symptoms and great distress in breathing.

Of the remaining twelve treated cases, all received regular treatments of graduated doses. Not a single one of the twelve patients showed any marked or, in fact, noticeable improvement or alleviation of symptoms until the advent of cooler weather and the end of the pollen season. One case, in spite of strenuous efforts to control it, progressed so rapidly and so severely that the patient was forced to leave the city for a prolonged sea voyage in order to obtain relief. Two of the cases stated that they felt a little easier after the injections, but this was not constant or permanent.

The results with the ragweed pollen extract as a therapeutic measure could not be considered encouraging. However, these patients were all requested to report next spring or early summer for a course of desensitizing treatments, to be completed before the commencement of the autumnal hay-fever season.

Goldenrod Cases.

An analysis of the five goldenrod patients shows that one case came in "for diagnosis only"; one had a very severe reaction following the first injection (0·1 c.c. of a 1-10,000 dilution), including increased asthma and some of the typical signs of hay fever which she had never had before; while three cases received from three to six injections. The case with the severe reaction received, six days later, a diminished dose of 0·1 c.c. of a 1-20,000 dilution, but unfortunately did not return or inform us of the reaction following the second injection. It was later understood that she had left the city shortly after the second injection.

Of the three remaining cases, one received three injections with a remarkable improvement of both local and generalized symptoms, commencing after the first treatment and with all symptoms entirely subsiding after the third injection. The other two cases each received six treatments with a gradual but complete subsidence of all symptoms. It is of course possible that this may have been due to the change in the weather and the elimination of the pollen, as the final treatment was given one case on September 26, and the other case on September 30.

The use of the extracts of goldenrod pollen gave manifestly better results than the ragweed pollen extracts. Although the series of cases was smaller and the treatments started slightly later in the season, introducing the uncertain element of the weather influence, it was felt that the patients received a distinct benefit from the treatments.

Summary.

1. Of twenty-seven cases of hay fever diagnosed, 81·4 per cent, were due to a sensitiveness to the pollen of the ragweed, while 18·5 per cent. were due to a similar sensitiveness to goldenrod pollen.

2. The diagnostic cutaneous reaction offers a simple and clear-cut method of determining sensitiveness to pollen proteins.

3. Treatment with the extract of ragweed pollen did not appear to have any favourable influence upon the course of the disease or the severity of the symptoms in twelve cases treated.

4. Treatment with the goldenrod pollen extracts in three cases was apparently beneficial in two cases and markedly so in one particular case.

Any method of diagnosis or treatment that will offer a suggestion of relief to the vast army of sufferers from this really serious condition should be given a thorough and conscientious trial. It is hoped that we will be able to try the effects of early desensitization upon many of the same patients before the commencement of the autumnal hay-fever season this year.

EXPERIMENTAL PELLAGRA IN WHITE MALE CONVICTS.[1]

By Joseph Goldberger, M.D. and G. A. Wheeler, M.D.
Washington, D.C.

Summary.

(1) An experiment was carried out at the Rankin farm of the Mississippi penitentiary to test the possibility of producing pellagra in previously healthy men by feeding a monotonous, principally cereal, diet.

[1] Abstracted from the *Archives of Internal Medicine*, vol. xxv, No. 5, p. 451, May 15, 1920.

(2) The subjects of the experiment were eleven white adult male convicts who volunteered for the purpose. They were segregated and kept under special guard. None gave a history of having had pellagra or of the occurrence of this disease in any member of the family or a near relative.

(3) All persons other than the volunteers resident on the farm were under observation as controls. This included 108 convicts, of whom thirty-five were under observation for a period comparable to the period of observation of the subjects of the experiment. In addition there were twelve free persons who were present throughout the study; included in these were four adult females and two children.

(4) The general sanitary environment was the same for subjects and controls. With respect to personal cleanliness, cleanliness of quarters, and freedom from insects and vermin, the volunteers were decidedly better off than the convict controls.

(5) No direct communication with the outside was permitted the volunteers. There was no special restriction imposed on the controls, convicts or free. Direct exposure of some of the controls to a hypothetical infection was possible and may have occurred when beyond the limits of the farm; this possibility is believed to have been excluded in the case of the subjects of the experiment.

(6) The volunteers continued to do a share of the work of the farm, but, when compared with the convict controls, they had shorter hours of work and had regular rest periods when in the field. The work of the convict controls is rated as requiring moderate to hard, that of the volunteers as moderate to light muscular exertion.

(7) The study falls into two periods. One extended from February 4 to April 19, during which the volunteers were kept under observation without any change in the regular prison fare; the second period extended from April 19 to and including October 31, during which the volunteers subsisted on the experimental diet.

(8) The average intake by the convict controls, as shown by four periods of a week, each varied between approximately from 3,500 and 4,500 calories, between 90 and 110 grm. of protein, 95 and 135 grm. of fat, and between approximately from 540 and 580 grm. of carbohydrate. Approximately from 20 to 35 per cent. of the protein was from animal food.

(9) The ingredients of the experimental diet were highly milled wheat flour, maize meal and grits, cornstarch, white rice, cane sugar, cane syrup, sweet potatoes, pork fat, cabbage, collards, turnips, turnip greens, coffee, " Royal " baking powder, salt and pepper. During the first three months some buttermilk was used in making wheat biscuits. All ingredients were believed to be of excellent quality and, with one or two exceptions, were part of the general camp supply. In its essential make-up the experimental diet was probably not entirely typical of the average pellagra-producing diet.

(10) The average intake by the volunteers, as shown by eight periods of a week each during the experimental period, varied between 2,500 and 3,500 calories, between 41 and 54 grm. of protein, between 91 and 134 grm. of fat, and between 387 and 513 grm. of carbohydrate.

(11) Although both classes of controls (convict and free) were exposed to the chance of direct contact with pellagra, and although, as compared with the volunteers, the convict controls were at a disadvantage hygienically, and were required to work harder, and furthermore, although various minor ailments and a number of rather sharp attacks of malaria were observed among them, none of the convict (or other) controls developed any evidence of pellagra. On the other hand, although segregated and under special guard and the possibility of direct contact with pellagra excluded, and although under much more favourable hygienic conditions, not less than six of the eleven volunteers who remained in the test to the end developed evidence which experienced observers joined with us in recognizing as those of pellagra.

(12) Significant subjective symptoms made their first appearance among the volunteers during the second month after beginning the test diet. These included weakness, abdominal discomfort or pain, and headache. All subjects lost weight, the loss becoming particularly marked during the last four weeks of the experiment. At least six of the eleven men developed a well-marked eruption. The earliest date of the beginning of this was September 12, or at about the end of the fifth month of the dict. The initial site in all the cases was the scrotum; later classical lesions also developed in one on the hands, and in another on the neck. The knee-jerk became exaggerated in five of the men, the earliest being October 17, at the close of the sixth month of the experiment.

(13) Having due regard for the controlled conditions of the experiment, the conclusion seems warranted that pellagra developed in at least six of our eleven volunteers as the result of the diet on which they subsisted.

(14) The scrotal lesion is a much more common early skin manifestation of pellagra than has heretofore been realized, but is nevertheless a somewhat unusual one.

(15) It is suggested that the site of at least the initial dermatitis accompanying an attack is bound up with a specific quality of the diet. The view is advanced that there exist essential differences in the intimate make-up of the diet corresponding to observed differences in some, at least, of the clinical types of the disease.

(16) In relation to the production of pellagra, the dietary factors to be considered as possibly essential are (1) an amino-acid deficiency, (2) faulty mineral supply or constitution, and perhaps (3) an as yet unknown (vitamine?) factor. As to which or what combination, or combinations, of these constitutes the specific pellagra-producing dietary defect or defects remains to be determined.

PREVALENCE OF PELLAGRA AMONG TURKISH PRISONERS OF WAR.[1]

By W. H. Wilson, P. S. Lelean, H. E. Roaf.

The objects of this experiment were as follows:—

(*a*) By comparison of the fæcal and urinary nitrogen, to determine the relative percentages of protein lost by non-absorption in two groups of (*i*) healthy and (*ii*) pellagrous prisoners of war receiving identical diets.

(*b*) By comparing the nitrogen intake with the urinary and fæcal nitrogen excreted by the healthy group, to estimate the availability (per cent. absorption) of the protein of the prisoners of war rations as issued to non-labour prisoners.

Two groups of five men each were placed in a separate enclosure, under the charge of a sergeant and two orderlies—day and night. The men were for two days, before the collection of samples began, living under the conditions of the experiment. Their weights were taken daily, and careful supervision was maintained over practice in the collection and measurement of excreta by the orderlies.

The fæces and urine, pooled for each group, were collected separately, and a daily analysis was made of the urine and fæces for each group. The average amounts per man were calculated from these daily analyses.

The food was that ordinarily consumed in the camp, but was issued by weight from bulk in the Quartermaster's stores, and was cooked in a separate kitchen for the two groups together. The conditions of the experiment did not admit of complete supervision of the issues from stores nor of the actual cooking, nor was it possible under the circumstances to obtain daily samples of rations corresponding to those issued to the subjects of the experiment; but samples were taken from the Quartermaster's stores on the day before the experiment began. The amount of food left over was carefully recorded.

The sequence of events consequent on lack of gastric acid is: Deficient pancreatic digestion; passage of undigested protein into the large intestine; bacterial putrefaction in that protein, leading to its destruction. The loss of protein, and especially of fat, even in the non-pellagrous, is obviously of extreme importance. Whether the digestive failure is due to pellagra, or the reverse, remains undetermined, but in either case the stage of malabsorption is regarded as being antecedent to development of clinical pellagra.

It is to be noted that indican was present in the pellagrin's urine. This substance is derived from the important amino-acid tryptophane of the protein molecule. On being broken up by intestinal putrefaction tryptophane is converted into indol, which is absorbed and excreted in the urine as the potassium salt of indoxyl-sulphonic acid. The indican is evidence of the destruction not only of tryptophane, but of the whole protein molecule, and thus of complete loss of the organism of an amount of protein corresponding to the amount of indican present in the urine. With a diet of a composition of the rations consumed by these men, the amount of indican present in the urine may, when a large quantity of this substance is present, represent a daily loss to the organism of as much as 20 grm. of protein. This amount ought probably to be deducted from the metabolized nitrogen as indicated by the nitrogen of the urine; whether this latter suggestion is justified or not, the presence of indican implies that the figure of 35·1 per cent. loss of protein in the alimentary tract represents only a part of the actual loss.

Perhaps the most important result of the experiment is to show that the percentage loss of ration protein in the intestines of healthy prisoners of war amounted to approximately one-third of the protein intake, instead of about 23 per cent. as estimated from previous knowledge. This means that whereas the Turkish prisoner of war (non-labour) diet, containing 91 grm. of gross protein, is assumed to give 68 grm. of protein available for nutrition, it actually yields no more than 60 grm. The biological value of the daily protein intake is thus reduced from about 38 to 33 grm.

From this experiment it is evident that, as compared with non-pellagrous, the pellagrous prisoners suffered from deficiency of food by:—

(*a*) Lack of appetite.

(*b*) Mal-absorption of protein and fat.

(*c*) Destruction of protein by bacterial putrefaction as shown by indicanuria.

[1] Abstracted from the *Journal of the Royal Army Medical Corps*, vol. xxxiv, No. 3, March, 1920.

TYPHOID AND PARATYPHOID INCIDENCE AND DEATHS IN THE AMERICAN EXPEDITIONARY FORCE.[1]

By Dr. Haven Emerson.

Including the cases of both typhoid and paratyphoid the case mortality was 11·25. For the French Army during the same period the combined death-rate from typhoid and paratyphoid fevers was 9·76. In addition to typhoid and paratyphoid fever there was a considerable number of benign enteritides among the troops of the A.E.F. Conditions were such that a thorough study of these cases in respect to the organisms concerned and a diagnosis on the basis of the laboratory findings as well as the clinical symptoms was impracticable. At one convalescent camp, during December, 1918, and January, 1919, a considerable number of patients came who had been treated for influenza eight weeks earlier. The attitude of the medical officers throughout the A.E.F. was such that they did not like to report typhoid or paratyphoid fever.

[1] Abstracted from the *Medical Record*, New York, vol. xcvii, No. 11, p. 462, March 13, 1920.

The intestinal type of influenza served to obscure the diagnosis of subacute enteritides, dysenteries, &c. The medical officers seemed to have an idea that, owing to protective inoculation, they would not find typhoid or paratyphoid fever. They were seemingly deaf and blind to the evidences of these diseases. Dr. Emerson related the history of three very definite epidemics of typhoid fever occurring in the A.E.F., one occurring in the Argonne region and including the personnel of a hospital there, a second in a traction company in Marseilles. In both instances the application of well-known sanitary procedures served to check the epidemic. In certain regions of France typhoid fever was endemic and it was probably only because of prophylactic inoculation that severe epidemics were prevented, as it might be recalled that there was an epidemic of typhoid fever in the French Army early in the War before it was possible to inoculate the soldiers against typhoid and paratyphoid. The third epidemic of typhoid fever which the speaker described was that occurring in the Camp Cody replacement company of 250 men of whom 99 came down with the disease. These men had all been vaccinated in different camps in the United States and by different medical officers. It seemed that this outbreak could be explained only by what might be called a massive hand to mouth infection. It seemed that the source of the infection was a water barrel attached to a kitchen car at Camp Cody. The Marseilles epidemic was due to failure to recognize large spleens, abundant roseola, and, at autopsy, Peyer's patches and even intestinal perforations. Failure to recognize early cases and exposure to massive doses of infection appeared to be the reason the protective power of prophylactic vaccination was overcome. There was no reason to believe that vaccination did not afford the greatest protection against typhoid and paratyphoid fevers. It was of the greatest value in our forces who were exposed to infection at countless points. In closing, Dr. Emerson urged the need of recording the weekly change in population in connection with the rates of incidence and mortality of disease.

Dr. Harlow Brooks stated that he had seen forty-seven cases of typhoid fever in France and some of them were held for three weeks before a diagnosis could be made. One of the best articles in the *Bulletin* published for the medical officers in France was on the subject of the anomalous symptoms presented by these patients. In one case ten blood cultures and ten stool cultures were made before it was possible to arrive at a diagnosis. The symptoms were different from those of a typical case of typhoid fever; especially in respect to the typhoid spots and the size of the spleen. He therefore felt there was some excuse for the failure to recognize the condition.

Dr. Emerson suggested the possibility that the symptoms of typhoid fever had been modified in these atypical cases by vaccination. He knew of several instances in which cases of typhoid fever were not diagnosed because of the unwillingness to accept typhoid fever as a probability in view of the indefinite symptoms present. However, there were a great many records in hospital reports in which the history on review seemed to be typical of typhoid fever. The pathologists were the first to discover the epidemics and this served as an illustration of the possibility of using the results of pathological examination as a warning of the presence of epidemic disease.

PYREXIA NOT YET DIAGNOSED, OF DENTAL ORIGIN.[1]

By Captain Herbert Wallis, R.A.M.C.

It should be emphasized that in these days of dental decay (and in certain classes of dental neglect) an oral examination in cases of what would otherwise be labelled pyrexia not yet diagnosed will reveal a definite cause and diagnosis, leading to immediate treatment and more rapid cure of patients.

Whatever may be the original cause, it is a clinical fact that septic conditions of the teeth and gums are of serious import in tropical climates, as there seems to be a tendency to more rapid development of the virulency of pathogenic organisms in the mouth giving rise to vague pathological conditions leading to definite disease.

Their blood films and cultures give negative results for malaria, relapsing fever, and for the enteric group.

In the absence of any apparent cause of fever the dental surgeon is called in for advice and treatment.

I examine the mouth for septic teeth and roots causing inflammation and pus discharge, and for evidences of pyorrhœa alveolaris, or for general neglect of the teeth.

(*a*) In cases where there are septic teeth and roots causing inflammatin, these are extracted, and warm mouth-wash such as a 1 in 120 lysol or any similar solution, is used every two hours; in addition, the mouth is syringed out two or three times in the manner described later. Under this treatment the temperature goes down, and the patient is ready for discharge in a few days.

(*b*) A frequent cause of pyrexia not yet diagnosed (particularly amongst Indian troops) is pyorrhœa.

The routine treatment for this is:—

(1) Thorough scaling.

(2) Syringing the gums under pressure three times daily.

(3) Local application of mist. dent. arsen.

Of these treatments special attention is given to syringing under pressure. For this purpose I use a rubber Higgenson's syringe, adapting a metal or vulcanite nozzle, the size of the bore being a little

[1] Abstracted from the *Journal of the Royal Army Medical Corps*, vol. xxxiv, No. 4, April, 1920, p. 360.

larger than the lead in a lead pencil; this gives a fine powerful jet or stream of fluid which is capable of forcibly penetrating between the teeth and within the gum margins. An orderly works the syringe bulb with both hands, using as much force as possible.

The operator is protected from the spray thrown back by a sheet of glass or celluloid held in front of patient's mouth.

A warm solution of 1 in 120 lysol or similar solution is used.

This syringing treatment is given two or three times daily, depending on the intensity of the condition.

Pyorrhœa alveolaris is very prevalent amongst the Indian troops, and, in addition, is, in many cases, the cause of anæmia, debility and other forms of sickness amongst them. A special ward is allotted for these cases for convenience of treatment, and to prevent the spread of infection.

Large concretions of tartar are often found, causing ulcers on cheeks and tongue. Thorough and extensive scaling is performed.

(2) A mouth application of mist. dent. arsen. is given. Mist. dent. arsen. is composed of:—

R	Vin. ipecac.	...	..	ʒii
	Liq. arsen.	...	..	ʒi
	Glycerin	...	...	ʒii
	Aquam	...	ad	ʒviii

This mixture is issued in two-trachm bottles (to obviate self-poisoning).

Three drops should be used twice daily; apply one drop at a time on the toothbrush. The gums should be gently brushed with this mixture on the brush.

SURGERY IN CHRONIC DIARRHŒA.[1]

By Samuel Goodwin Gant, M.D., LL.D., New York.

THERE are many types of diarrhœa, such as gastrogenic, enterogenic, neurogenic and others, that are not surgical conditions, since they are relieved or cured by rest, diet and medication. Mild forms of enterocolitis also respond to this treatment reinforced by medicated colonic irrigation. Chronic diarrhœa is a surgical condition when the rectum and colon are extensively involved through catarrhal or mixed infection processes, accompanied by a violently inflamed or extensively ulcerated mucosa causing frequent fluid evacuations containing a considerable amount of mucus, pus, and blood. Formerly, when a patient complained of severe diarrhœa, abdominal pain, and mucus or bloody evacuations a diagnosis of dysentery was made, but the term should be discarded since this symptom complex accompanies several types of ulcerative colitis.

Considering the subject from an etiological viewpoint we have to deal with catarrhal, tuberculous, luetic, amœbic, bacillary, balantidic and helminthic colitis. There is another form of diarrhœa requiring surgical treatment, viz., obstructive, and this is seldom correctly interpreted. This variety of loose movements may be induced by benign or malignant neoplasms, stricture, hypertrophied rectal valves, or any lesion that constricts or occludes the colon or rectum, and patients afflicted in this manner are usually treated for constipation in the beginning and ordinary diarrhœa later, without the physician having suspected an obstruction.

The surgical treatment in such cases consists in excising the lesion, or if inoperable and dangerous obstruction prevails, in making an artificial anus. Several operations have been employed in the surgical treatment of chronic diarrhœa due to catarrhal or specific ulcerative colitis, appendicostomy, cæcostomy, Gant's ileocæcostomy and colostomy, procedures not resorted to until medical treatment and irrigation by way of the anus have proved ineffectual.

Appendicostomy is simple, effective and requires but ten minutes to perform when the cæcum is exposed through the right rectus and the appendix is brought out and anchored in a stab wound incision. When diarrhœa is increased and the stools contain an abundance of pus, blood, and mucus, the appendix is opened, a Gant appendiceal irrigator or catheter is inserted, and the colon immediately flushed; but in less severe cases the appendix is amputated a week later and irrigation inaugurated, which diminishes danger of infection and skin abscesses.

Cæcostomy.—This operation is resorted to following previous appendectomy, and when appendicostomy is attempted and found impracticable because the appendix is congenitally absent, too short, narrowed, strictured or otherwise diseased. The technique of stab wound cæcostomy is not difficult; leakage is prevented by infolding pursestring sutures, and the cæcum is suspended to the parietes to lessen danger from peritonitis. Mortality of this operation is slightly higher (two per cent.) than appendicostomy, and there may be superficial infection owing to opening of the bowel during operation.

Gant's Ileocæcostomy.—Appendicostomy and cæcostomy and through-and-through irrigation are effective in colitis, while ileocæcostomy is indispensable in cases of ulcerative, catarrhal and specific ileocolitis. In this procedure which is not dangerous, following the opening of the cæcum, a Gant rubber enterocolonic irrigator is introduced and fastened by circular infolding sutures after its distal end has been projected through the ileocæcal valve into the ileum. This instrument enables the attendant to separately or simultaneously irrigate the colon and small bowel after the plan demonstrated. Patients suffering from chronic diarrhœa, anæmia and autointoxication rapidly improve in appearance and weight when the bowel is thoroughly cleansed daily by irrigation, using warm water, normal saline or an ichthyol two per cent., balsam Peru two per cent. solution or an oil and bismuth emulsion, provided the position of the patient is changed from time to time during the irrigation in order to ensure the solution reaching the ulcers wherever they may be. My patients are

[1] Abstracted from the *New York Medical Journal*, vol. cxi, No. 17, whole No. 2160, April 24, 1920, p. 709.

placed upon practically a normal, full diet when irrigations are inaugurated, and on account of this and feeling that a cure is being accomplished the mental attitude of these patients is quickly improved. The catheter or irrigator is not removed and the opening is not closed earlier than from three to six months, otherwise recurrence sometimes takes place. Appendiceal and cæcal openings are closed by electric cauterization or preferably fulguration of the mucosa and adjacent skin, which may require one or several applications.

Colostomy.—This procedure has been employed formerly, but has been superseded by appendicostomy and cæcostomy in the treatment of chronic diarrhœa, because of the severity of the procedure, and patient objecting to bowel movements through the side and serious operation required to close the artificial anus.

BOTULISM: PROTECTIVE MEASURES AND CAUTIONS.[1]

The U.S.A. Public Health Service, in common with other federal, State and municipal authorities charged with the enforcement of laws and regulations for the protection of the public health, has been deeply concerned because of the frequent reported fatalities in different sections of the country attributed to the consumption of food products infected with the organism known as *Bacillus botulinus*. These fatalities have quite recently been traced to the consumption of ripe olives, although some cases have also been traced to home-canned string beans, home-canned asparagus, and home-canned corn. In making inquiries as to the activities of various Government agencies in connection with outbreaks of botulinus poisoning, the Public Health Service has learned that the Bureau of Chemistry of the Department of Agriculture, which is charged with the enforcement of the Federal Food and Drugs Act, has been particularly active in the investigation of these cases. Investigations have been directed by that bureau, not only toward an application of the safeguards provided by the terms of the law for the removal of dangerous material from the market, but also to a scientific investigation of the causes and characteristics of botulinus decomposition.

No one knows just how the *Bacillus botulinus* gets into any particular food. It has been found in articles put up in the home by the careful housewife and in goods packed by commercial establishments. It may be present in a few packages only of any lot. There is no method, the Bureau of Chemistry states, by which the packers or home-canners can assure themselves by casual examination before canning that a product does not contain the *B. botulinus*. If the food were in all cases properly sterilized and perfectly sealed, the development of the poison would be impossible, but no method of preserving food has yet been found which eliminates the occasional spoiled package. Failure to sterilize may not become apparent for weeks or even months after the canning of the article. If signs of spoilage have appeared when the container is opened, it is a clear warning that the product is no longer edible.

There is no greater probability of botulinus poisoning in olives than in many other food products, either commercial or domestic. Until this year it has been more commonly found in string beans, asparagus, and the like. It was originally found in sausage. It has been found in cheese; it is present sometimes in stock food, such as mouldy hay and other kinds of spoiled forage, but it has never been found in the Bureau of Chemistry's investigations in any kind of food which was not spoiled.

[1] Abstracted from the *U.S. Bureau of Chemistry, Department of Agriculture, Public Health Reports*, vol. xxxv, No. 7, February 13, 1920, p. 327.

A "FROGHOPPER" AS A BLOOD-SUCKING INSECT.[1]

By C. Donovan, Lieut.-Colonel, I.M.S.

To add to the list of several blood-sucking insects already known, I now send in the name of a member belonging to the order Homoptera or Hemiptera-Homoptera. So far as I am aware, this order has not supplied any instance of a species with such propensities. In Madras, especially after the North-east monsoon—that is, in the months of November and December—large numbers of small whitish-green "froghoppers" come to light at night, and some of these bite, or rather sting, by means of their sharp proboscides. Several people used to complain to me of being stung by these insects, but, not being cognizant at the time of such habits among the Homoptera, I discountenanced these tales of the presumed aggressors. It was only when I was myself a victim of the insects' action that I was disillusioned.

These insects sting both at night and on cloudy days. I procured four of these "froghoppers," two caught actually in the act of sucking blood and two others hopping about at the same time and place. These I took to Dr. Gahan, of the South Kensington Museum, and they were identified by Dr. Distant. The two blood-suckers were *Phrynomorphus indicus*, Distant, and the other two included one of the same species and another Jassid, named *Nephotettix bipunctatus*, Fabr., which I cannot accuse of any malpractice. Dr. Gahan tells me that Dr. Guy Marshall informs him that he has from time to time received Jassidæ sent to him from Africa as blood-sucking insects, and he does not know of any records of the kind published.

In adding this member to the list of blood-sucking insects, I wish to demonstrate that we have reached no finality in our knowledge of sanguinivorous flies.

[1] Abstracted from the *British Medical Journal*, No. 3,085, February 14, 1920, p. 220.

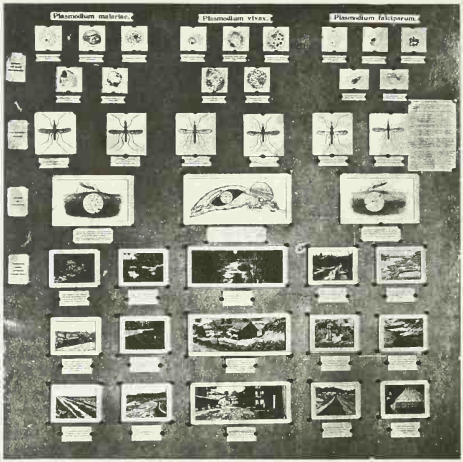

FIG. 1.—Malaria screen. Coup d'œil of the disease.

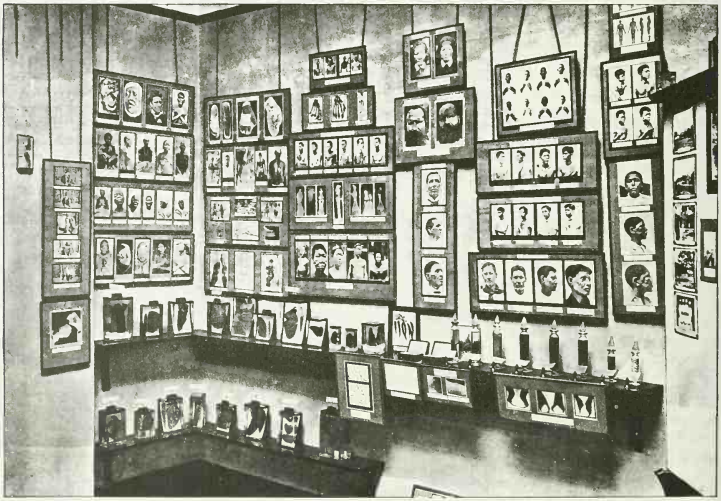

FIG. 2.—Portion of leprosy section.

To illustrate paper, "The Graphic Method of Demonstrating Tropical Medicine and Hygiene," by ANDREW BALFOUR, C.B., C.M.G., M.D., F.R.C.P.E., D.P.H., and S. H. DAUKES, O.B.E., M.B., D.P.H., D.T.M. and H.

Original Communications.

THE GRAPHIC METHOD OF DEMONSTRATING TROPICAL MEDICINE AND HYGIENE.

By

ANDREW BALFOUR, C.B., C.M.G., M.D., F.R.C.P.E., D.P.H.,
Director in Chief, Wellcome Bureau of Scientific Research,

AND

S. H. DAUKES, O.B.E., M.B., D.P.H., D.T.M. and H.,
Curator, Wellcome Museum of Tropical Medicine and Hygiene.

THE power of conjuring up a mental picture from a written description varies in different individuals; some possess an extraordinary facility in this direction, but to the vast majority some visual representation is necessary to bridge the gap. This is a fact which is acknowledged by almost every textbook dealing with practical medicine or surgery, and it is especially true of the larger works devoted to tropical medicine, which usually teem with plates and text figures.

Such illustrations are of value even where every facility is provided in the ward, out-patient department or post-mortem room, for seeing the actual condition under consideration. In certain circumstances a carefully arranged scheme of pictorial representation is invaluable, more especially where the student is preparing himself to deal with conditions and circumstances which are foreign to his immediate environment.

Two examples are especially apposite: the army medical officer being trained at home to carry out sanitary work abroad, and the medical practitioner who is about to take up some appointment in a tropical or subtropical climate. To expect such men to learn their lesson from bitter experience is unsatisfactory and wasteful; as far as possible they must be brought into touch with their future environment and the diseases they will meet.

What is true of medical men is even more true of the laity, and it is most essential for a nation which boasts a world-wide empire to safeguard its manpower by furnishing information regarding the dangers inseparable from the administration of its possessions.

Tropical conditions cannot be reproduced, and clinical material is often not available: it is therefore desirable, indeed essential, to illustrate as graphically as possible every subject upon which knowledge is required. A museum in the ordinary sense of the word is not sufficient; the most complete series of pathological specimens can give only a very imperfect idea of the morbid processes to which these specimens pay a grim tribute. Photographs and coloured illustrations carefully chosen and arranged are needed to complete the picture, and they can carry conviction even to those whose powers of mental imagery are markedly deficient. Moreover, scope is afforded for æsthetic treatment. There is no reason why a museum should, as is so often the case, be dull and ugly. Subjects, even if in themselves repellent, may be so handled as to produce a pleasing effect without there being any accompanying loss of scientific interest or accuracy.

Tropical medicine lends itself admirably to such a system of pictorial representation, and an effort which is being made in this direction possesses special interest at the present time.

In 1913, thanks to Mr. Wellcome's interest in the matter, a museum of tropical diseases and hygiene was started in connection with the Wellcome Bureau of Scientific Research. It was hoped to provide means of visual training, and to bring before those going to tropical climates the various details of environment, hygiene and disease which they would encounter. Furthermore, it was felt that a museum of this kind would appeal to medical officers and others returning from the tropics. Such men are often too tired and played out to settle seriously to a course of hard study. Their time may be limited, and they may not care, during a period of leave and recuperation, to devote many hours to hard reading. On the other hand, there is every possibility, and events have shown this to be the case, that they will be glad to turn their attention to exhibits which can be studied profitably without much mental effort and which will be useful to them not only by refreshing their memories, but by supplying them with mental pictures which on their return abroad are likely to aid them in their work.

The two illustrations accompanying this paper, figs. 1 and 2, which were taken early in the history of the museum, gives some idea of the lines upon which it was hoped to develop the scheme.

Little progress could be made during the war, as practically the whole medical staff of the Bureau was on active service; but after demobilization the work was resumed, and has been considerably developed along the original lines, which it is believed constitute a new departure in museum work.

A short description of the section on malaria, as now arranged, will illustrate the method, which is generally applicable.

Each section is introduced by a summary of up-to-date knowledge. After a short historical survey, an introductory screen supplies a *coup d'œil* (fig. 1) in colour of the etiological factors: every painting is carefully selected so as to emphasize some lesson with regard to the disease. The three different parasites are shown, together with a selection of mosquito vectors from different parts of the world. The method of transmission follows, and lends itself especially well to graphic representation. The lower portion of the screen is occupied by a series of coloured drawings demonstrating the factors which predispose to infection—various breeding places in stagnant pools, defective gutters, unscreened water-barrels, irrigated fields, paddy fields, derelict boats, &c. The lesson of the mosquito net is taught by a picture showing a net improperly arranged and torn. This screen is of value to the layman as well as to the medical man, and throughout the museum a similar *coup d'œil* has been designed for each important disease.

Following on this introduction the etiology is dealt with more completely, and illustrations are given to

emphasize the more important differences between the various forms of parasites: aberrant forms are included, also the method of cultivation, with a short descriptive summary. Microphotographs demonstrate Thomson's grounds for disputing Schaudinn's theory of parthenogenesis. Illustrations of the hæmamœbæ of birds and apes follow, and immediately precede a detailed, illustrated description of how to make a thin and thick blood film.

A schematic representation of the life history of the parasite is followed by paintings, coloured prints and photographs showing in detail the development of the plasmodium in the mosquito. The next series of illustrations deals with the breeding of mosquitoes in captivity, and with the dissection of the insect.

Points in epidemiology are elucidated by appropriate maps and plans. The distribution of the disease is explained by maps showing the world distribution, and others dealing with points of special interest.

The clinical section includes temperature charts and illustrations of patients suffering from the disease.

In the pathological section, specimens of various affected organs are displayed, and paintings, photographs and microscopic drawings illustrate all the important points in the morbid anatomy.

Treatment is dealt with in the same graphic manner: charts show the effect of various drugs upon malarial pyrexia. Methods of treatment are fully described and discussed. The cultivation of cinchona is represented by a series of photographs carrying one from the seedling through the small plantations to the forests, where the bark is stripped. Samples of the crude product of the factory are exhibited, and finally the various forms in which quinine is administered. Each preparation is labelled to show its dose, method of administration and equivalent strength.

The importance of preventive measures is brought home by a large series of photographs exemplifying first of all mosquito breeding grounds grouped under the headings: (1) Woodland; (2) ponds and streams; (3) marshes; (4) those due to defective engineering —bad roads, borrow pits, &c.; (5) domestic breeding places, such as water-barrels and faulty guttering.

The section is partitioned into ten divisions: (1) Examination of carriers; (2) mosquito surveys; (3) propaganda work in various countries; (4) filling in; (5) draining; (6) municipal works; (7) use of oil; (8) natural enemies, including specimens of larvivorous fish; (9) personal protection, mosquito net, &c.; (10) propbylactic quinine.

A very useful type of mosquito trap, as employed in Zanzibar, is also included in this section in the form of a model.

The entomological relations of malaria are fully considered in a series of illustrations with descriptive text and specimens, and these can be viewed through a special glass designed so as to show their minute characteristics, thus rendering it unnecessary to remove fragile specimens from the glass cases.

The general arrangement also of the museum is planned upon somewhat new lines. Recent years have borne abundant testimony to the value of prevention in tropical medicine, and an effort is being made to group the diseases in such a way that by their arrangement they will emphasize the chief factors concerned in their etiology. Such a scheme has a great practical value, for the preventive measures for each group are very similar.

One may classify diseases etiologically in the following way:—

A. *Parasitic.*

(i) Due to "contact," either direct or through the agency of clothes, bedding, &c. Also due to direct inoculation through the skin or mucous membrane.

Examples: Many skin diseases, venereal diseases, small-pox, tetanus, yaws.

(ii) Due to "mouth to mouth" infection, through the agency of so-called "droplet" infection, expectoration, coughing, sneezing, &c.

Examples. Influenza, pneumonia, pneumonic plague.

(iii) Due to "droplet" infection, as above, or to infected scales from the skin, or to infected discharges from the nose, throat or ear.

Examples: Measles, small-pox, chicken-pox, diphtheria.

(iv) Due to excremental infection, through the agency of water, food, flies, fingers and dust.

Examples: Enteric fever, dysentery, diarrhœa, cholera, worm infections of many kinds, including schistosomiasis.

(v) Due to inoculation through the bites of insects, or the entry through skin abrasions of the infected excreta or infected crushed tissues of insects rubbed or scratched into these lesions.

Examples: Malaria, yellow fever, tick fever, sleeping sickness, filariasis, relapsing fever, typhus fever, bubonic plague.

(vi) Due to invasion of the body by insects in their adult or larval stages.

Examples: Chigger, myiasis of various kinds.

B. *Non-parasitic.*

(i) Due to climatic conditions.

Examples: Heat stroke, diarrhœa in some instances, constipation in many cases, rheumatism, prickly heat.

(ii) Due to errors in diet.

Examples: Diarrhœa, beriberi, scurvy, sprue (?).

(iii) Due to poisons.

Examples: Scorpion sting, snake-bite, vegetable poisons.

(iv) Miscellaneous, including developmental defects, mechanical injury and new growths (non-parasitic).

Such a system of grouping, though it presents certain difficulties, emphasizes many important points and lends a fresh dignity and force to the work of prevention. There is far too great a tendency to divorce clinical from preventive medicine, with the result that the latter is frequently relegated to a secondary position. All are willing to acknowledge that prevention is better than cure, but few are disposed to accord this belief practical recognition.

In addition to these arrangements there is a part of the museum wholly devoted to the hygiene of the

tropics. Every branch of sanitation is represented, special attention being given to tropical foodstuffs and the pests, be they animal or vegetable, which attack and destroy them, for it must be remembered that famine is only too frequently a precursor of epidemics.

Moreover, an attempt is being made to collect pictorial representations of all the institutes, in the tropics and elsewhere, which are concerned with the study of tropical medicine and hygiene. In this way persons proceeding abroad can readily get some idea of the facilities which exist for research in any particular country. It is surprising how little is known about this subject, and how such a display gives a rude shock to the complacency which adopts as its motto, "We are the people and wisdom shall die with us."

At present the museum is in a state of transition, but ere long it is hoped to have it adequately housed in suitable premises adjacent to the Bureau.

Help in the way of photographs, specimens, &c., from those who have it in their power to aid this work will be gratefully accepted and duly acknowledged. There is undoubtedly a great need for a museum of this kind, which can be made thoroughly representative only by the good offices of those for whose use it is intended and to whom it makes its appeal.

THE SURGICAL TREATMENT OF ULCUS TROPICUM.

By Robert Howard, M.D., B.Ch., Oxon.

Medical Officer, Pemba, Zanzibar, late Medical Officer of the Universities' Mission to Central Africa.

Tropical phagedæna, or the tropical sloughing ulcer, is familiar to most doctors in the tropics, especially to those whose work lies in hot, damp agricultural districts. The causative germ is generally stated to be the *Spirochæta schaudinni*. It is found in great numbers in the discharge, and also in the softened tissues at the edge of the ulcers, generally in symbiosis with *Bacillus fusiformis*.

In most text books of tropical diseases, a detailed description of the distribution, clinical symptoms and pathology of this disease is given, but little space is devoted to its treatment. Local antiseptic applications or various caustics are recommended, and the statement is made that with this treatment the sloughing process can generally be got under control in a week to a fortnight, but a warning is added that not infrequently a relapse of phagedæna may occur in an ulcer that is apparently going on well.

Those who are familiar with the horrible smell and profuse discharge from these ulcers will surely want to apply some more radical treatment before admitting the patients to the general ward of their hospital.

About eighteen years ago I was told by Dr. Norris, of the Scotch Established Church Mission, Blantyre, Nyasaland, that he had found scraping with a Volkmann's spoon under an anæsthetic far the most satisfactory treatment. This is the treatment to which I now wish to call attention. I have applied it wherever possible to all except very slight cases, or where the patient declined to submit to an operation. In these latter instances the unsatisfactory result obtained from the local antiseptic treatment generally recommended has brought out in a convincing contrast the advantage of the surgical method. The operation is of the simplest possible character. It consists in scraping away all the sloughs and softened tissue with a Volkmann's spoon. It will be found that the infected tissue readily breaks down under the spoon, while the sound tissue underneath is resistant. When a firm base of sound tissue has been obtained, the undermined edge of skin is cut away with scissors curved on the flat, so as to leave no pockets. Any ragged pieces of fibrous tissue that remain in the base of the ulcer are then cut away with scissors.

The surface is washed over with an antiseptic, and then dressed with cyanide gauze and some antiseptic wool, and firmly bandaged. The operation only takes about five minutes, and it could easily be done under nitrous oxide anæsthesia if available, though in the parts of Africa in which I have worked I have always had to use chloroform.

The first dressing is done forty-eight hours after the operation, and the wound will be found clean and free from any smell. If the ulcer has been treated early before it had reached the deep fascia it will show a perfectly clean granulating surface in a week. If the deep fascia has been penetrated, and especially if tendon sheaths have been reached, there are often fibrous tags which take some time to separate, but there seems to be no tendency to any recurrence of the phagedænic process. I imagine that this easy cure of the condition is due to the observed fact that the spirochætes do not penetrate deeply into the tissues, and that they are only in the softened tissue which is removed by the spoon; while any that may remain on the surface of the cleaned ulcer are easily destroyed by antiseptics.

At one time in the more severe cases I tried applying 10 per cent. chloride of zinc to the cleaned surface, but I have come to the conclusion that it is quite unnecessary, and the sloughing which it causes delays the granulation process. I continue the cyanide gauze dressing until the granulations are well formed, and all fibrous tags have disappeared, and then dress with ointment.

If the surface is comparatively small it may be allowed to granulate up; if it is large it is possible to do Thiersch's grafting from fourteen to twenty-one days after the ulcer was first scraped. The new granulations are found quite healthy and can be lightly scraped away, giving a firm flat surface on which the grafts readily grow. If grafting is adopted the original size of the ulcer makes little difference to the ease with which it can be cured. On the other hand the depth to which the sloughing has penetrated does make a difference in prognosis.

As mentioned above, an infected tendon may delay the establishment of really healthy granulations, and

this is still more the case where the periosteum of the tibia is involved, resulting in local caries of the bone. The softened bone can be scraped away, and the ulcer got clean, but it is of course slow to granulate so as to be ready for grafting.

Such cases require patience, but eventually they can be perfectly cured, whereas on the old method of treatment it was this involvement of a patch of bone or tendon that proved a refuge for the spirochætes and served as the starting point for a recurrence of the phagedænic process after apparent improvement.

The relief to the patient that results from this simple operation is most marked. Once the ulcer is scraped clean there is practically no more pain, the œdema rapidly subsides, while the smell, of which the patient and his friends are often acutely conscious, entirely disappears. In my experience once natives are made familiar with the idea of this operation, and see its benefits, they readily consent to it. The operation itself requires no instruments beyond sharp spoons and scissors, and is of such short duration that it can, if necessary, easily be done in the out-patient department, and the patient permitted to go home and come for regular dressings. Several babies have been treated on this method whose mothers would never have consented to leave them in hospital. Lastly, no elaborate method of after treatment, *e.g.*, irrigation, is required.

Conclusion.

In the treatment of tropical ulcer thorough scraping and cutting away of overhanging skin under an anæsthetic is at once the simplest, quickest, and most effective method of treatment, and should be adopted as a routine practice.

Medical News.

IMPORTANT recommendations for extending the scope and usefulness of the work of the Institute of Tropical Medicine at Townsville, North Queensland, were decided upon at a recent meeting of the committee, when it was decided to recommend to the Federal Cabinet proposals for strengthening the staff of the Institute and extending and intensifying its work. These include the opening of experimental stations at Port Moresby, Papua, and Rabaul, and an addition to the staff of officers to carry out investigations on the spot into any outbreaks of tropical disease without interfering in any way with the regular routine of the laboratory work and tests. While these proposals involve some educational experience, it is held that the committee will be amply justified by the more thorough manner in which it will be possible to cope with tropical diseases in Australia, and by the extension of the sphere of operations to Papua and former German territory. It is hoped that eventually all the medical officers appointed to posts in the Pacific territories will take a course at Townsville.

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THE JOURNAL OF

Tropical Medicine and Hygiene

SEPTEMBER 1, 1920.

BODILY POWERS AS TESTED BY THE OLYMPIC GAMES.

REPRESENTATIVES of most countries of the world have been assembled in Belgium lately, engaged in contests of almost every known sport, game and athletic exercise. Each nation has carried hence, also, its national characteristics in regard to its

methods of physical training and its mental attitude bearing upon sport as it is understood at its home in Britain. Such gatherings are supposed to promote good fellowship between peoples, and foster the good feeling that all hope to promote between nations. How far this has been carried out during the present "Olympiad" is not evident as far as can be gathered from the reports that have reached us.

The peoples allowed to be the foremost athletes in the recent contests are Great Britain, the United States of America, the Swedes and the Finns. Of these the Swedes alone regard athletic exercise as a national asset in the physical training of their people, and place such training on a higher platform than any others. With the Swedes, physical training is a national question, and by encouraging and enforcing it they hope to better not only the physique, but also the mental fitness of their nation. It is an interesting experiment. We are familiar with the legend of the Healthy Body as regards producing a healthy mind. By a healthy mind in this connection is meant a moral mind, and morality from the sexual point of view; but that it leads to a capable brain, or one endowed with gifts of intellectual, commercial or judicial greatness, is another matter. The whole process of athleticism to-day is an artificial process, something added on to the daily life, something outside the bodily development which accrues from work necessary to produce a livelihood. The original calling of man was tilling the soil and following the chase, and making the instruments for these callings to be carried on. These afforded all the physical exercises sufficient for man's welfare. Military training became necessary as mankind multiplied, and the grouping into tribes, states, nations and empires resulted, whereby these several communities could defend themselves from aggressive neighbours, or when they in turn became aggressive themselves. This implied, in the earlier days especially, physical fitness to a degree more advanced even than to-day, when man met man in personal conflict, and the better developed man overcame his enemy. This was notably the case in Greek and Roman times before firearms were introduced, but since then the introduction of modern weapons extended the arts and sciences necessary to produce them. Commerce demanded an enormous section of the people with whom physical exercise played no great part in the scheme of daily work, and it is amongst these artificial means of exercise had to be introduced, and as something added on to their life's work, and it is mostly amongst these that our modern athletes are to be found. The clerks in our cities are being trained to a degree that exceeds what is required either to till the soil or to produce machinery. The farm labourer and the blacksmith's upper limbs are shabby compared with those of the gymnasium-trained clerk. The huge muscles of the city clerk are trained to a degree far beyond the needs of men engaged in the heaviest toil; his work is to drive a quill at his desk, yet he has a biceps like a leg of mutton in size and chest muscles alongside of which the labourer's muscles are insignificant in development.

Women are in the same category. In earlier days her duties were in the house or in the fields, each sufficient to maintain her physique. But as society became more complex, servants did her work in the house and men took her place in the fields. Enforced leisure drove her to artificial exercise, hence the tennis and golf players, and the many forms of exercise she now takes part in.

The artificial form of exercise came to be known as games, sports and such like names; and amongst the men more especially some became known as professional players, in other words men who did nothing but played games for a livelihood. The Olympic Games are regarded as contests by amateurs only, that is those who add sport to their daily work and do not take payment for the part they play. It is here that troubles have arisen in such contests, for an amateur athlete in British estimation has no real equivalent in another. To the amateur the contest is a mere pastime, for the professional the results are bread and butter, that is a means and the only means it may he of livelihood. Success and failure to each of these groups differ widely, so much so that to a man or woman making a livelihood by his or her muscular efforts failure may mean ruin. That so-called "shady" means of winning creep in is not surprising, for to win is to live, to fail is starvation, to the professional. In Britain, with her accumulated wealth and a multitude of leisured folks, amateur "sport" was possible; in other countries, without, or practically without, a leisured class, such a product of society was impossible. Britain set the example, and "sport" became a national feature of the people. Honour in sport became an emblem of our national character, and to "play the game" a legend of our faith. The phrase "it is not cricket" is our modern expression to indicate dishonesty in husiness as well as in sport.

That this phase of sport has done much good in Britain is undoubted, but there are often whisperings that other nationalities fall short of this standard, and "they are out to win," and the means to that end, are not always as they should be.

To such a climax has this grown in the most modern of these International contests that the British seem inclined to withdraw from taking part in them. If sport is not to train our youths to "play the game," the question arises is it worth while to make the fetish of it we do?

Is sport *necessary* to produce a powerful and physically fit people? The Turk, who can take a load, say a grand piano, on his back and carry it to its destination, is not artificially trained by sports or games. He bears a load which it takes usually three or four men of other nations to carry. The Japanese, who pulls a rickshaw with a passenger or two behind him at a trotting pace for forty or more miles, owes his power to working at his calling. The China woman, who can carry across her shoulder a bamboo laden with anything from seventy to eighty bricks for several miles, accomplishes her task by muscular power acquired by a training having nothing to do with sport, or contest in games, but by the neces-

sities of her daily life. If our athletes and those devoting themselves to sport were to become athletes by doing work whilst training, the results of their energy and muscular expenditure, instead of "beating the air," would develop people fitted to carry out the work of the world and at the same time play the game to some better purpose than by being high amongst "the averages." The tendency of the present day athletes is to develop arm muscles in a gymnasium which they will never be called upon to use, whereas the lower extremities are neglected. Any game, sport or exercise which develops the upper to the neglect of the lower extremities (which is usually the case) is not training the body aright. Real good is brought about by also developing the lower extremities. This can best be done by walking, not running (which from the hygienic standpoint should be confined to boys). Were the citizens of our large towns to walk to and fro to their offices they would be doing athletic work which would add to their physical strength, and would not necessitate them wasting their time, as in the eyes of tropical folks we do, in gymnasia, tennis, golf, &c., &c.

Walking would improve the physique of our town dwellers, lessen the number of vehicles in our streets, fill the pockets of the workers in our cities, teach people to take pride in themselves by making them self-reliant, and to take heed in an exercise which saves their pockets and brings health to their system and power to their limbs. Let us have exercises which bear immediate fruit, and which gives us something more than the empty and frivolous glory of driving a ball over a net or into a hole in the ground. If we work to become a nation of athletes, let it be by doing something useful. Whilst we practice exercises in our gymnasia with doubtful good to our frames, the fisherman brings home something for food, the man who "follows the chase" fills our larders with grouse, partridge, pheasant, a rabbit, or a hare, and at the same time brings well-being to his own frame; but ball games have nothing to show for all the energy they expend, nor does climbing ladders hand over hand. By learning to swim or to shoot straight (which can only be perfected by keeping oneself fit by walking), by carpentry, by gardening, by field work on our farms and many other exercises, we have natural forms of work whereby our frames can be kept fit, and without further training let us by all means have contests, but of a character in keeping with useful ends without artificial training, and the man or woman who does her natural daily task best has the honour and credit of his or her superiority.

J. C.

Injections of Adrenalin in the Diagnosis of Latent Malaria (Azzi, *Policlinico*, November 30, 1919).—The author has found injections of adrenalin by far the most certain and satisfactory method for driving malarial parasites into the blood of the general circulation. According to his experiments 1 milligramme of adrenalin, injected subcutaneously, is uniformly followed by the appearance of plasmodia in the blood-stream, commencing about twenty minutes after the injection. The injection is always harmless.

Annotations.

On the Relation of Temperature to Malaria in England (Angus Macdonald, *Journal of the R.A.M.C.*, August, 1920).—The author calls attention to the fact that anopheline mosquitoes are widespread in England, and that malaria has occurred in England in the past, though its continuous endemicity is doubtful. The normal temperature of England is insufficient to maintain malaria endemic under modern living conditions. According to the author's researches, temperature decides infection and determines incidence; but as it is impossible to prognosticate the temperature of any year, it is necessary to take preventing measures in England in face of a large importation of malaria patients and malaria carriers.

The Alkali Reserve in Pellagra (Sullivan and Stanton, *Archives of Internal Medicine*, July 15, 1920).—The authors have tested fifty-six pellagra patients for alkali reserve by the alveolar air method and by the determination of the carbon dioxide bound by the blood plasma. None showed a marked depletion, about one-third showed a slightly subnormal level, while the greater number were within normal limits. The authors came to the conclusion that there is very little uncompensated acidosis in pellagra.

Anti-typhus Work in Belgrade (L. F. Cope, *Journal of the Royal Medical Service*, No. 3, July, 1920, vol. vi).—The cases, as a general rule, were not of a severe type, and the mortality was not high. The spread of the epidemic was largely limited by the fact that a large proportion of the population had already had the disease, and still more by the fact that methods of communication were very difficult. All the railways had been destroyed by the enemy in their retreat, and the majority of wheeled vehicles, horses and draught cattle removed, so that walking was the only means of getting about, and this in the bitter winter weather was only resorted to in cases of absolute necessity.

Before the author took up the work there had been sixty-five cases of typhus in Belgrade, mostly among repatriated Czechs. During the first five weeks upwards of 5,000 men were delousted. During this period there were only thirty-seven fresh cases, though it was the coldest weather experienced during that winter, and the whole of Northern Serbia was full of typhus centres. There were several instances in which a regiment or establishment furnished one or two cases, and after immediate delousing no further cases appeared. Of the thirty-seven fresh cases that appeared after the author and his co-workers began work, twenty declared themselves in the first week. The author is of opinion that typhus will probably remain endemic in sporadic outbreaks throughout Northern Serbia for many years to come; but that, with energetic handling of such small outbreaks, any further pandemic, such as that of 1915, should not recur, at any rate in our generation.

Current Literature.

ANNALS OF TROPICAL MEDICINE AND PATHOLOGY, Vol. xiv, No. 1, June 30, 1920.

Notes on Blackwater Fever in Macedonia (J. F. Gaskell).—From an analysis of seven cases of blackwater fever encountered in the Serbian Army during the winter of 1917-18 the author concludes that the pathology of this condition consists in the sudden occurrence of an extensive hæmolysis in the bloodstream brought about in certain cases of chronic malaria by the administration of quinine; exposure to cold being usually a contributory factor. The hæmolysis is comparable to that of paroxysmal hæmoglobinuria, being chemical in nature and rapidly completed. The excretion of hæmoglobin occurs if not too highly concentrated, otherwise coagulation takes place in the loops of Henle, and suppression of urine occurs, which is usually fatal. Continuation of quinine administration increases both the toxicity and the probability of suppression, though it does not prolong the period of hæmolysis. Treatment should be directed to the prevention of collapse and to the dilution of hæmoglohin and toxins by the administration of fluids in quantity by every available method. Quinine should be stopped immediately the blackwater fever is discovered; its further administration is dangerous and unnecessary, for the blackwater fever itself destroys the malarial parasites in the blood. In any particular patient a critical dose of quinine is necessary to produce an attack of blackwater fever; malarial attacks in such a patient can be successfully treated by doses below this limit.

The Nomenclature of the Parts of the Male Hypopygium of Dipteria nematocera, with special reference to Mosquitoes (F. W. Edwards).—The great diversity and confusion which exists in the classification and nomenclature of the structure of the tip of the male abdomen amongst insects generally, and particularly amongst the mosquitoes, is pointed out. The hypopygium of mosquitoes is composed of four distinct parts, namely:—

(1) A more or less complete chitinous ring, representing the tergite and stemite of the ninth abdominal segment.

(2) A pair of appendages of the ninth segment, more or less ventral in position (except secondarily in mosquitoes).

(3) Chitinized pieces surrounding the anus.

(4) Chitinizations of the genital tube as opposed to the main body wall which forms the other three parts.

Each of these elements is discussed in great detail. A table is given showing the chief terms which have been used by different writers on the culindæ and those proposed by the author, together with those used by Newstead for phlesoforms and by de Meijere for the tipulidæ for purposes of comparison.

Studies on the Various Types of Malarial Infection and the Effect of Quinine Treatment thereon among the Native Population of the Malay Archipelago (N. H. Swellengrebel and J. M. H. Swellengrebel de Graaf).—In epidemic districts in the Malay Archipelago quinine treatment greatly reduces the number of crescent carriers among the adults, the chances of the anophelines becoming infected being thereby reduced. This alters the nature of the parasite infection among the inhabitants, causing it to approach the endemic type. In the endemic areas it is the children only who are the gamete reservoirs, and it is an extremely difficult matter to cure them.

Heat and Stegomyia Fasciata: Short Exposures to Raised Temperatures (J. W. S. Macfie).—The author's experiments showed that the ability of *Stegomyia fasciata* to withstand sudden exposure for five minutes to a raised temperature is greatest in the egg stage, slightly less in the pupal stage, and least in the larval and adult stages.

Oral Administration of Quinine or Quinine and Arsenic for Short Periods to Young Native Children infected with Malignant Tertian Malaria (J. W. S. Macfie and M. W. Fraser).—Seventeen native children at Accra, in the Gold Coast, West Africa, were given quinine hydrochloride gr. 10 and quinine sulphate 10 to 20 gr. without ill-effects, showing how well children stand relatively large doses of quinine. In seven of the cases parasites persisted in the blood, notwithstanding treatment, showing the necessity of blood examinations in the rational treatment of malaria, since it is the presence of parasites, and not the occurrence of fever, that is the actual and potential danger in malaria. They also found that native children may have malaria parasites in the blood *abundantly* for many consecutive weeks without being troubled by febrile attacks.

Oral Administration of Quinine Sulphate, 20 gr., to Adult Natives Infected with Malignant Tertian Malaria (J. W. S. Macfie).—Quinine sulphate, 20 gr., was administered orally in solution to eleven adult native men infected with malignant tertian malaria in the Gold Coast. In all the cases the pophazoites disappeared from the cutaneous blood in one to two days, and there was no febrile or parasitic relapse in sixty to sixty-four days.

Oral Administration of Quinine Sulphate, 10 gr., daily for two consecutive days only to Native Schoolboys Infected with Malignant Tertian Malaria (J. W. S. Macfie). — Quinine sulphate 10 gr. for two consecutive days only were given to sixty-two native schoolboys at Accra, whose ages ranged from 5 to 18 years. All the boys appeared to he healthy, hut were found to he infected with malignant tertian malaria by blood examination. This dose of quinine was sufficient in every case to cause disappearance of the parasites from the cutaneous blood in one to two days. After this treatment parasites reappeared in the blood in the majority of the cases, the percentage of parasitic relapses being highest in the age-group comprising boys of 12 to 14 years.

Oral Administration of Quinine Sulphate to Natives Infected with Quartan and Simple Tertian Malaria (J. W. S. Macfie).—In quartan and simple tertian malaria, as has been shown to be the case in malignant tertian malaria, the percentage of relapses in natives other than very young children treated in the tropics is decidedly less than in Europeans treated in England.

Crossocephalus Zebræ N. Sp. (W. Yorke and T. Southwell).—A profusely illustrated description of a nematode worm found in considerable numbers in the intestines of six zebræ (*Equus burchelli*) shot in Northern Rhodesia. Morphologically similar it presents some differences in detail from the worm described by Von Linstow (1899) and subsequently named Crossocephalus by Railliet (1909). The authors therefore consider their worm as a new species of the genus Crossocephalus. Bayliss (1919) gave the name *Crossocephalus longicaudatus* to a closely allied species found in a rhinoceros from the Malay Peninsula.

On the Results Obtained from Surveys for Breeding-places of Tree-hole Mosquitoes in Liverpool and Neighbourhood (B. Blacklock).—In a series of six surveys, five in the Liverpool district and one in Delamere Forest, Cheshire, 2,500 trees were examined up to a height of twenty-five feet for breeding-places of *Anopheles plumbeus* and *Ochlorotatus geniculatus*. Eighty-three holes and fifty-one forks and clefts containing water were found. Sixteen breeding-places of *A. plumbeus* and nineteen of *O. geniculatus* were found; larvæ of *A. plumbeus* and *O. geniculatus* were associated thirteen times. Breeding-places of *A. plumbeus* occurred in 0·64 per cent. of trees examined, and in 19·2 per cent. of holes containing water. The majority of the breeding-places were over six feet from the ground. Elms, horse-chestnuts and sycamores provided the great majority of the breeding-places; oaks, Spanish chestnuts and firs provided no breeding-places, and very few holes containing water.

Abstracts.

SUCCESSFUL TREATMENT OF GIARDIASIS IN MAN WITH NEO-ARSPHENAMIN.[1]

E. I. Carr, M.D., Lansing, Mich., and W. L. Chandler, Ph.D.

THE pathogenicity of *Giardia* (Lamblia) *intestinalis* is now fairly definitely established; in fact, this flagellate has recently been described as the causative organism of "trench diarrhœa," a condition which most of the overseas troops experienced and from which a number of the returned soldiers are still suffering.

Several different medicaments have recently been employed in the treatment of this disease; and, while some of these have been found to give temporary relief, no permanent cure has hitherto been effected.

The rôle which salts of heavy metals, notably mercurial and arsenical preparations, play in the treatment of syphilis and some other flagellate diseases is common knowledge; and at least two groups of workers have observed that the cysts of *Giardia muris* disappeared from the fæces of infected rats following intravenous injections of heavy doses of arsphenamin. Probably the most noteworthy of these observations are those made by Kofoid and his associates. However, so far as we are aware, no attempt has been made to utilize these substances in the treatment of human diseases caused by intestinal protozoa.

Since neo-arsphenamin is being used with good success against the syphilis flagellate, it occurred to us that intestinal flagellates, and possibly also other intestinal protozoa, might prove to be susceptible to the action of this product; and, moreover, since the oxidation products of neo-arsphenamin are readily excreted by the way of the intestinal tract, intestinal protozoa ought to be more easily reached than the syphilis organism, which is often intracellular. It was, therefore, not surprising when in the course of our investigations we observed that not only the cysts of *Giardia intestinalis* and *Chilomastix mesnili*, but also those of *Endamœba coli*, *E. histolytica* and *E. nana*, rapidly disappeared from the stools of man following intravenous injections of neo-arsphenamin, and that the cysts of *Eimeria stiedæ* disappeared from the fæces of rabbits following intramuscular injections of heavy doses of neo-arsphenamin. Whether or not the results obtained through this treatment are permanent is yet to be determined. A number of cases are under observation, and these will be reported on as soon as a sufficient period of time has elapsed to enable one to draw definite conclusions. In the case here reported, however, a permanent cure appears to have been established.

Neo-arsphenamin Treatment (three injections).

December 24, the patient reported a recurrence of the abdominal discomfort. An examination of his stool made on this day revealed numerous cysts of *Giardia intestinalis*. These cysts varied greatly in size and shape; some typically shaped cysts were only one-third the usual size, others were larger than normal, while still others were flat on one end. December 24 and 29 and January 2, intravenous injections of 0·6 grm. each were made; and, following the second injection, calomel and castor oil were administered by mouth. Stool examinations were made daily for twelve successive days during and following the period of treatment; and for six successive days once a month thereafter.

Results.

The cysts of *Giardia intestinalis* were greatly reduced in number in the first sample collected after the first injection and were entirely absent from the stools on the second day after the first injection, and have not since recurred. The patient's condition has greatly improved; his stools have become normal and his abdominal discomforts have abated.

[1] Abstracted from the *Journal of the American Medical Association*, vol. lxxiv, No. 21, May 22, 1920, p. 1444.

LIPURIA ASSOCIATED WITH CHRONIC NEPHRITIS.[1]

By Louis Bauman, M.D., Iowa City.

Almost all of the recorded instances of fat in the urine appear under the caption "chyluria." The several features of this condition which are now more or less well recognized are the occurrence of fat, fibrinogen or fibrin, red and white blood cells in the urine, the direct quantitative relationship between the fat ingested and that excreted in the urine, and lastly, the increase in fat elimination during rest in the recumbent posture. Both the parasitic (filarial) and the nonparasitic forms have been explained by a fistulous communication of the lymphatics with some part of the urinary system. In 1908, Magnus-Levy stated that lipuria could arise only in this manner. Five years later, Sakaguchi found that the average fat elimination through the urine in health and in a variety of diseases was about 8·5 mg. per day, and that this amount could be increased fourfold by fat ingestion. Only in one case of chronic parenchymatous nephritis did the fat rise to 73 mg. This the author thought was probably due to an altered permeability of the renal tubules. In the course of their work on the behaviour of stained fat in the animal organism, Mendel and Daniels noted that rats fed on lard stained with Sudan III excreted both fat and dye in the urine. Dr. Amy L. Daniels has kindly permitted us to insert two typical protocols of unpublished experiments.

More recently the work of Sanes and Khan also indicated that an abnormal permeability of the renal capillaries or epithelium might be a factor in the production of lipuria. The data at our disposal appear to support this view. At least, the available evidence makes it probable that there are at least two types of lipuria, the one associated with fistulous communication, the other entirely due to an abnormal permeability of the renal cells.

Report of Case.

History.—A white farmer (clinical number 4,928), aged 37, who had never lived in a tropical region, married, and the father of four children, admitted to the University Hospital, August 2, 1918, admitted a gonorrhœal infection about one year previously, but denied syphilis, though his wife had had two miscarriages. His family history was not significant. He had undergone two operations: an appendectomy, in 1913, and another operation for peritoneal adhesions one year later. He had also suffered from small-pox and scarlatina. His present illness began in March, 1918, with headache, swelling of the ankles and dyspnœa. July 1, 1918, he first noted that his urine was cloudy and oily. Physical examination detected an œdema of the legs, a hypertrophied heart, and blood-pressure of 150 systolic and 100 diastolic. Blood examination revealed a moderate secondary anæmia and a strongly positive Wassermann reaction, which was negative on three subsequent occasions after arsenical treatment. The patient was discharged much improved Sept. 13, 1918, but was readmitted November 26 of the same year, with headache, generalized œdema and fullness of the abdomen. The beart was large, the liver palpable and tender, the blood-pressure: systolic, 190, and diastolic, 120. In spite of treatment the headache increased in severity, and the eyegrounds, which were normal on the first admission, now showed albuminuric retinitis and retinal hæmorrbages. The signs and symptoms of pneumonia developed, and death, which occurred Dec. 16, 1918, was preceded by vomiting, convulsions and coma.

Urine examinations.—The urine was always cloudy. Its specific gravity ranged from 1·013 to 1·018. It was neutral of alkaline, and contained much albumin and many casts, and occasionally a few red and white blood cells. Fat globules were never present. The renal dietary test (August 6) showed a maximum specific gravity of 17 points. The night urine measured 220 c.c. and had a specific gravity of 1·018. A sample of the turbid urine was evaporated to dryness and extracted with alcohol-ether mixture. The extract was precipitated with acetone. The precipitate gave positive results for phosphorus and glycerol, thus indicating the presence of lecithin. The filtrate responded to the test for cholesterol.

The influence of fat ingestion on the fat content of the urine was studied by Bloor's method.

A second dietary test was performed, December 12. The maximum specific gravity was 1·020, the variation of specific gravity was 12, the night urine measured 950 c.c., and its specific gravity was 1·008. No retention of nitrogen or chlorine was found during a period of five days.

Necropsy findings.—(By Dr. Frank Paul.)—Each pleural cavity contained about 300 c.c. of yellowish, watery fluid, which coagulated spontaneously. The lower lobes of both lungs showed bronchopneumonia. The heart showed hypertrophy and dilatation, especially of the right side. The aorta was normal throughout. There was no enlargement of the thoracic duct or other lympbatics. The abdomen and its contents were normal except for the kidneys. These measured 13 × 8 × 3 cm., and weighed 215 grm. On section they cut with little or no resistance. The cortex measured 1 cm., was soft, and presented a yellowish, fatlike appearance. The capsules stripped easily. The pelvis contained an unusually large amount of fat. Frozen sections stained with sudan gave negative results. Further microscopic examination of the kidneys disclosed the fact that the tubules in the cortical region were swollen, and that the cells were large, cloudy and granular, but not fatty. In some, the lining cells were entirely absent. The glomeruli were enlarged, and many showed an increase in connective tissue but no fatty or amyloid degeneration. A large number were adherent to the capsular wall. The capsules were thickened and very vascular. The capsular epithelium showed proliferation in certain instances. Areas of round-cell infiltration were present. The medulla was very vascular. The

[1] Abstracted from the *Journal of the American Medical Association*, vol. lxxiv, No. 20, May 15, 1920, p. 1,375.

tubules were not as large as in the cortex. Their lining cells were clear. There was a slight increase in connective tissue. Sections of the kidney stained by Levaditi's method for spirochætes were negative. Excepting for a marked degree of endarteritis, microscopic examination of other organs, including the brain, was negative.

Comment and Conclusions.

The clinical, chemical and pathologic data suggest a progressive nephritis, possibly of syphilitic origin, associated with lipuria and terminating in uræmia. The lipuria was influenced by the amount of fat in the diet. The absence of coagulated protein, the scarcity or absence of cells in the urine, and the apparent absence of a fistulous communication, indicate that the lipuria was due to an altered permeability of the renal epithelium. The presence of lecithin and cholesterol are worthy of note (though both substances have been found by a number of authors on previous occasions). In this case there was no increase of cholesterol in the blood. The occurrence of typical uræmic symptoms without cerebral œdema or retention of urea has also been pointed out before. The incidence of syphilis in this case recalls the work of Stengel and Austin, who noted the frequent occurrence of doubly refractile bodies in the urine in nephritis associated with syphilis.

ARSPHENAMIN REACTIONS.[1]

By John F. Martin, M.D.

In large hospital clinics where syphilis is treated with various arsphenamin preparations, reactions occur more or less frequently, depending on the care taken in preparing solutions, the purity of contents, the elapsed time between the making of the solution and its administration to the patient, the amount of arsphenamin given, operative technic and skill, and factors within the patient. While a given brand of arsphenamin might, through some circumstance, very rarely prove toxic, the precautions taken to make such possibilities remote (chemical, animal and clinical controls), usually mean that arsphenamin has to be discharged for want of evidence. Arsphenamin might have been guilty of causing some of the reactions on which this paper is based, but this could not be proved.

When directions are carefully followed in preparing the arsphenamin solution, and in administering it to the patient, if a reaction follows, then the cause of the reaction is attributable either to the brand of arsphenamin used or to the patient. Printed directions accompany each ampoule of arsphenamin, whether it be diarsenol, arsenobenzol, salvarsan or arsaminol, and are specific and easy to understand; and it is laxness in following these directions that accounts for the greater number of reactions to treatment. When a trained and careful person prepares the solutions of arsphenamin, reactions will seldom occur in hospital clinics or in private practice.

Necessary Precautions.

One should note any departure from the normal lemon-yellow colour of the brand of arsphenamin being used, and then immerse the ampoule in 95 per cent. alcohol for fifteen minutes to detect obscure cracks. Cracked ampoules or ampoules that contain discoloured arsphenamin are to be rejected, the substance having become oxidized. It is a good plan to mark down the serial numbers of the ampoules used in order to check up with the manufacturer in case the arsphenamin is suspected of being the cause of a reaction. One is further directed to prepare individual solutions, and when this is not practical, not to prepare more solution than can be disposed of within half-an-hour. Using the syringe-container method, and allowing six minutes for each 0·5 grm. of arsphenamin in solution, limits the number of ampoules that may be used at a time to five. The sooner the solution is disposed of, the less danger of oxidation.

Using the directed technic for one brand of arsphenamin while preparing the solution of another will, in some cases, cause reactions. Salvarsan (Metz) calls for freshly distilled water of not more than room temperature; diarsenol requires warm, freshly distilled water; and arsenobenzol is to be dissolved in boiling hot, freshly distilled water. Salvarsan becomes oxidized when dissolved in hot water. The directions call for freshly distilled water or physiologic sodium chloride solution, prepared from chemically pure sodium chloride—not from table salt. It is directed that normal sodium hydroxide (4 per cent.) or 15 per cent. solution be used to neutralize and alkalize arsphenamin in solution. Faulty preparation with impure or altered sodium hydroxide, or contaminated distilled water, may cause reactions.

Neutralizing arsphenamin, which is dihydrochloride salt, requires a definite amount of sodium hydroxide to render it slightly alkaline and suitable for use. A large percentage of reactions resulting when technic is not strictly followed are due to hypo-alkalization, while hyper-alkaline solutions, due to faulty measuring of sodium hydroxide solution, causes reactions at times. A graduated pipette or burette is recommended to be used, the certainity being a normal-sized drop and accurate measure. Arsphenamin is precipitated as a basic salt by sodium hydroxide; it requires a definite amount to redissolve the precipitate, changing the basic salt to a monosodium salt, the solution being just alkaline to litmus paper. On further addition of a definite amount of sodium hydroxide, a disodium salt is formed which is completely soluble in water. The basic precipitate and monosodium salt will cause reactions, the disodium salt in solution, properly diluted and filtered, being suitable for use.

All manufacturers agree that solutions should be of room temperature. Injecting too cold solutions into the circulation will induce chill reactions. Too rapid giving of the solution, particularly in high concentration, will cause reactions in some instances.

[1] Abstracted from the *Journal of the American Medical Association*, vol. lxxiv, No. 18, May 1, 1920, p. 1,218.

One is advised not to give more than 0·1 grm. of drug (30 c.c. of solution) in two minutes; the gravity method is the one advised; the rate of flow is controlled by the size of the needle (No. 18 or 20 B. & S. gauge) and the height of the column of fluid. The syringe-container method is favoured by many operators, and while not as "fool proof" as the gravity method, an expert can handle difficult work with greater precision.

Giving too large a dose of arsphenamin at the beginning of a course of treatment accounts for some reactions. Lack of preliminary preparation for treatment—a laxative the night before, and a light breakfast four or five hours before operation—is sometimes a cause. Every patient should be given a careful physical examination to determine organic or functional impairments, as findings may limit or contraindicate arsphenamin treatment. When two or more reactions occur from a multiple ampoule solution, in the majority of instances the fault will be found in the technic of preparing the solution, and the usual cause will probably be hypo-alkalinity.

Factors attributable to the Patient.

Both arsphenamin and the technic in preparing its solution having been excluded, factors attributable to the patient are to be considered. Tissue susceptibility to arsphenamin medication include allergic idiosyncrasy, an inherited dominant susceptibility to arsphenamin medication; anaphylaxis, protoplasmic sensitization from repeated doses; blood synthesis reactions, in which arsphenamin becomes altered or precipitated from causes not understood, or ascribed to excess of carbon dioxide in the blood, or faultily prepared arsphenamin solutions; and the nitrioid reaction, ascribed to the action of arsphenamin in destroying spirochætes and liberating large quantities of bacterial protein to which the tissues have to be sensitized. The Herxheimer reaction is attributed to the stimulating activity of non-sterilizing doses of arsphenamin.

Reaction symptoms occur singly or in syndromes, while the injection is being given, soon after the patient leaves the table, or a few hours or days later. The most common type of table reaction is the vasomotor syndrome, usually manifesting dermal capillary flushing, dyspnœa, coughing, nausea and subcutaneous œdema, two or more symptoms being present. The vasomotor type of reaction has been ascribed by Pardo and others to the vasodilating action of arsphenamin. Insufficient alkalization of arsphenamin solutions account for a large number of this type of reaction. Hirano claims that arsphenamin anaphylactoid symptoms are due in many cases to a deficient epinephrin content in the blood resulting from sudden consumption after intravenous injection of arsphenamin, and from an inhibition of epinephrin secretion by the suprarenals. When repeated reactions of this type occur, preceded by a number of arsphenamin treatments without reaction, epinephrin deficiency as a possible factor causing the reaction is to be considered. Preinjection of epinephrin tends to prevent this reaction, as well as relieve the symptoms when it occurs.

Another type of reaction occurring infrequently, but liable to occur while the patient is on the table, is the "spine-pain," characterized by the patient's complaining of stabbing pains in the lumbosacral region. The pain is usually intense; it is in most cases accompanied by vasomotor symptoms, and might be the result of vasomotor influence on various viscera, and registering on respective nerve centres in the spinal cord.

According to Kolmer and Yagle, arsphenamin causes hæmolysis, particularly when injected in concentrated solution, but it is not so likely to do so when in weaker solution or when isotonic salt solution is used instead of distilled water. Hæmolytic action of arsphenamin solutions is said to be increased by hyper-alkalization. Dilute solutions of neoarsphenamin (0·9 grm. in 90 c.c. or more water) are claimed to cause hæmolysis, while concentrated solutions (0·9 grm. in 30 c.c. or less of water) are not hæmolytic.

Functional and Organic Impairments.

Reactions other than those due to anaphylaxis and blood synthesis arise from functional and organic impairments causing certain viscera to be more susceptible to arsphenamin medication. Neurologic reactions present the hysterical type, usually not attributable to arsphenamin but to psychophysical upsets, before or after treatment. Syncope, headache, vertigo, neuritis, pseudo-epilepsy, and Herxheimer manifestations affecting special nerve centres occasionally arise, owing to either sensitization, vasomotor action, or activating syphilitic lesions. Reflex enuresis has been observed in two cases, immediately following arsphenamin treatment.

Dermal reactions sometimes occur, and appear to be due to large doses of arsphenamin, dominant susceptibility, anaphylaxis, faulty elimination, blood synthesis, and the administering of toxic arsphenamin solutions. The eruptions appearing may be scarlatinal, maculopapular, or may simulate dermatoses, as pityriasis rosea.

"Arsphenamin jaundice" is a coined term applied to jaundice manifested by patients who have received arsphenamin medication. There are two forms, corresponding to the catarrhal or hepatogenous, and the toxic or hæmatogenous, the former being due to obstructive elimination arising from such causes as cholangeitis or hepatitis, which may or may not be due to arsphenamin treatment. The hæmatogenous form is probably due to toxic products of arsphenamin blood synthesis, toxic arsphenamin solutions, sensitized hepatic tissue, or overworked hepatic function, resulting in low-grade or toxic degeneration. Chronic hepatitis may be a contributory cause.

Jaundice following arsphenamin treatment usually occurs after a number of doses of arsphenamin have been given, and it has been observed that patients that show an exhausted or diminished tolerance, manifested by various reactions, are prone to have jaundice at a later period if arsphenamin treatment is carried on without a rest from treatment of one or more weeks. The usual case of arsphenamin jaundice

clears up in from two to four weeks; the severe, toxic type of jaundice, while rare, is likely to be fatal.

Reactions to arsphenamin treatment are a warning signal that there is a cause to be found, and that a review of the patient's history, physical condition, the brand of arsphenamin used, and the technic of preparing the solution and administering it to the patient should be undertaken. It sometimes happens that treatment has been too prolonged in persistently positive cases, and the tolerance to arsphenamin, and also to mercury, has become exhausted. In such cases a rest from treatment of one or two months does much to rejuvenate the patient.

Classification of untoward Incidents and Reactions.

Sequelæ arising from arsphenamin medication may be thus classified: the incidents, slight untoward symptoms occurring in patients with normal tolerance to arsphenamin, such as vertigo, palpitation, disturbances of taste and smell, or slight nausea; the reactions usually occurring in syndromes, and causing discomfort and sometimes incapacity, which may be ascribed to allergic or acquired susceptibility to arsphenamin, functional or organic complications, or toxic arsphenamin solutions; the grave reactions (sometimes fatalities), such as dermatitis exfoliativa, toxic jaundice, hæmorrhagic excephalitis, and gangrene; the accidents, such as thrombosis, phlebitis, and infiltrations about a vein.

With careful observance of all precautions in the administering of a properly prepared arsphenamin solution to a risk-free patient, if treatment is not too energetic, reactions may be reduced to a minimum, both in private practice and hospital clinics. Each patient, during a course of treatment, should be carefully observed as to individual susceptibility and tolerance for arsphenamin. Standard treatment may serve as a guide for the average case, but one must individualize to prevent reactions and best treat the patient.

Correspondence.

The subject of the rarity of finding malaria parasites in malaria infected persons elicited the following interesting letter from Dr. W. G. Heath, of Montserrat, British West Indies, on the benefits of *continuous vaginal irrigation in post-partem febrile* cases. He also confirms the remarks on the rarity of finding malaria parasites in malaria infected persons as enunciated by Sir James Cantlie in the editorial in question.

To the Editors of the Journal of Tropical Medicine and Hygiene.

Montserrat, B. W. I.,
July 23, 1920.

Dear Sirs,—Reading an article in the Journal of Tropical Medicine and Hygiene entitled "A Malarious Blood," recalls a case which I attended about two years ago, which has always been a puzzle to me, and which also presents one or two points of interest. This was a labour case (multipara). She had before marriage lived in a malarious district and had suffered severely from malaria, but had not had an attack for some years. She also suffered from boils, and had to cut her hair short to treat those on the scalp. The labour presented nothing peculiar. I was only present at the end of it. The child was large, weighing about 12 lb. No douching was ordered, as it was thought unnecessary; but a day or two after the temperature gradually began to rise. Douching was then ordered, and quinine prescribed. The temperature still kept up, and then I made a vaginal examination, and found a split in the cervix. A vaginal douche was given, after which the temperature went up to 104° F. A colleague was called in consultation. He made an examination of the cervix, and within a few minutes the patient turned very white, and had a severe attack of ague, and the temperature shot up suddenly to 107° F. Fortunately ice was at hand, and we soon had her packed in it, and this brought the temperature down to about 104° F. It then occurred to me that it would be a rational thing to irrigate the torn cervix by continuous saline irrigation. We filled a douche can with physiological saline solution and hung it over the bed. The nozzle at the end of the tube had a stop-cock which was arranged to let the solution flow at a "quick drip." The nozzle was then tied into the vagina, as one ties in a catheter, and the vagina lightly packed with gauze. The patient lay on a rubber sheet; quinine was also continued. The temperature gradually came down, though there was another—a slighter ague attack the next day, and in a few days the temperature fell to normal, and did not rise again above normal. The continuous irrigation was kept up for about 48 hours. Afterwards ordinary douches with the saline was given.

Was the toxæmia due to malaria, or to septic infection, or perhaps due to the furunculosis, or to both? The continuous irrigation with physiological solution was a novelty, as I have never seen it mentioned before for this purpose, but if it succeeds in deep-seated wounds, why not in wounds of the cervix?

As you know, Government medical officers, especially in these small places, as Montserrat, are supposed to do everything. We do our own operations, from opening abscesses to abdominal sections. We are gynæcologists, and midwives, and anæsthetists. We diagnose, and prescribe, and pull teeth, and do our own microscopic work in the intervals of dispensing worm powders and dressing ulcers. We are consulted on a sick cat or cow. We are members of all sorts of boards, committees and councils, and even have to check the Treasury cash or departmental stores. Thus there is little time for preparing and examining blood slides, but in those I have done have seldom found parasites.

Please excuse this rapidly written note, but it may be of some interest.

Yours faithfully,
W. G. Heath.

Original Communications.

BRONCHO-SPIROCHÆTOSIS (CASTELLANI'S BRONCHITIS).

By C. L. Browne, L.R.C.P., L.R.C.S.

Assistant Medical Superintendent, Clare Hall Sanatorium.

This condition was first observed by Castellani in 1905-06 in Ceylon, and his findings were subsequently confirmed by other workers: Branch, in Kingston, St. Vincent, in 1907; Jackson, in the Philippines in 1908; Waters, in India in 1909; Phalea and Kilbourne in the Philippines in 1911, and in the same year by Chamberlain in the Philippines and Macfie in West Africa.

Cases have since been recorded as having occurred in various parts of Europe. In 1915 and again in 1917 Galli Valerio recorded some cases in Switzerland. Lurie described a case in Serbia in 1915. In 1917 Violle was first to observe this affection in France and recorded some cases. Since then other cases have been recorded by Bine, Dide, and Ribereau, by Netter, by Dalunier, by Barbary, and by others. Rubiere and Gautier, in 1918, described some cases in France among French and Indo-Chinese soldiers. Jacono has observed the malady in Dalmatia, and Alcock described this condition as occurring in a British soldier in Italy, and Villa, Corvetto and Carini have noted a few cases in South America.

Castellani did some further work in this connection in the Balcanic-Adriatic Zone.

Investigations were carried out by Chalmers and O'Farrell in the Soudan in 1913, and they successfully reproduced the disease in a monkey, but attempts to infect guinea-pigs and rabbits were unsuccessful. In 1914, Taylor also investigated this condition in the Soudan. Fantham studied the morphology of the *Spirochæta bronchialis* and published his observations in 1915.

Geographically the distribution of this disease appears to be general.

The ætiology of this complaint is unquestionably due to the activity of the *S. bronchialis* (Castellani).

In morphology, the organism varies in length from 5—30μ, in breadth from 0.2—0.4μ. It is actively motile with tapering ends. In addition to the free and motile stage Fantham describes a coccoid stage and an intracellular stage. He considers the coccoid or granular stage as being a resting stage.

Fantham, Chalmers, O'Farrell and Taylor recognize *S. bronchialis* as being quite distinct from the oral forms. There are three types of this disease described by Castellani: the acute, subacute and chronic.

Acute type. Onset sudden, with a feeling of chill—the temperature is raised, with cough and some generalized pains. Expectoration is small in quantity. Physical signs of bronchitis are present. Recovery usually takes place in a few days.

Subacute type. Onset more or less sudden, with frequent cough associated with a pink coloured mucus expectoration. There may be actual hæmorrhage. The temperature may remain normal or there may be a slight rise. The physical signs are those of bronchitis. The attack lasts from a fortnight to several weeks.

Chronic type. This type usually follows the subacute form. Cough is chronic and sputum usually not abundant. Slight hæmorrhages may occur from time to time, and sometimes on two, three or more days in succession. The quantity of blood is usually small, from about two to four drachms. Larger quantities may also occur. The temperature is generally normal. Some cases may present a small evening rise, or the chart may show instead a morning rise. The physical signs are usually those of bronchitis. The patient is usually fairly well nourished. There may be some slight secondary anæmia where there has been frequent loss of blood. It is this chronic form which is more likely to be mistaken for pulmonary tuberculosis.

The two following cases treated in the Clare Sanatorium will probably help to illustrate the chronic form of this malady.

Case 1. E. B., male, aged 47 years. Admitted on May 5th, 1919. Born in England and lived there all his life. Health was good till nine years previous to admission, when he had a severe attack of bronchitis. This left him with a cough, which continued slight till October, 1918, when a second attack of bronchitis ensued. After recovery cough still continued and became very persistent. About the middle of February, 1919, he had an attack of hæmoptysis, in quantity about an ounce. Between the middle of February and the end of April he had five similar attacks, and on each occasion the amount was about an ounce. No family history of tubercle bacilli traceable. The general condition of patient on admission was good and his temperature was normal.

Lungs. Signs of bronchitis present.

Mouth. Some carious teeth present on spongy gums, bleeding easily on pressure.

Pharynx. Injected but no definite soreness present. Patient did not feel his throat sore.

Sputum. Frequent and careful examinations were made and no tubercle bacilli were found, but spirochætes were present in enormous numbers. Sputum was almost purulent in character with an offensive odour. As secretion from crypts between teeth and gums showed heavy infection, great care was taken in having the mouth thoroughly washed with antiseptic lotion, just before obtaining sputum. This appeared to make no difference in the enormous numbers of spirochætes present. Morphologically the spirochæte was actively motile and varied in length from 7—29μ, with tapering ends. The spirals varied from 2—9 and were quite irregular. An occasional one with regular spirals was found. On staining, carbol gentian violet gave the best result. Fontana's method was also good. The Romanowski stains did not give such good definition. Gram's stain was negative.

Treatment.—Adrenal (disodium methyl arsenate) was given by mouth in $\frac{1}{2}$ gr. doses twice daily after food, for some weeks. There was a diminution in the number of spirochætes at the end of this period, and an improvement in the general health of the patient. Cough was less persistent. Kharsivan in doses of 0·1

gramme was next given intramuscularly, till 1·2 grammes had been administered.

Under this treatment the number of spirochætes diminished rapidly and cough became considerably less. Patient slept better and his general condition was satisfactory. On discharge spirochætes were still present, but not many. A mouth wash was used throughout the course of treatment and the teeth were attended to by a dentist.

The patient had no recurrence of hæmoptysis while under treatment. I interviewed this patient six months after his discharge. He has kept well since he left the sanatorium. His cough has practically ceased, except for a little on waking in the morning.

I examined his sputum, and after an hour's careful search of a series of films taken from different parts of the sputum, I was unable to find a single spirochæte.

Case 2. D. L., aged 28 years. Female. Admitted on July 21st, 1919. Her trouble commenced with hæmoptysis in March, 1915. She has had frequent hæmorrhages since then, sometimes for several days consecutively. She has been in several institutions for the complaint. She was born in England, and has lived there except for three years spent in Canada, 1911—1914. In November, 1912, she was operated on for gastric ulcer, and a month later a second operation was performed for the same cause. In the winter of 1913 she underwent an operation for appendicitis. On her return to England she developed intestinal obstruction, and was operated on at St. Mary's Hospital, Paddington. Later, in the winter of 1914—15 she had pneumonia and pleurisy, which left her with a cough. Her first attack of hæmoptysis came on very shortly after this. On the first day of her admission she had a small hæmoptysis of about an ounce at most. During her stay here she has had frequent hæmoptysis, varying in quantity from two drachms to four ounces, and occasionally more. On five or six days in succession she has produced coloured sputum. Routine examination of sputum showed enormous numbers of spirochætes. Examination of mouth showed some carious teeth, with spongy gums, which bled easily on pressure. Secretion from crypts between the teeth showed very large numbers of spirochætes. The same precaution was taken to prevent contamination from the mouth. Frequent and careful examination of the sputum resulted in no tubercle bacilli being found. Physical signs in the lungs were those of bronchitis. Abdomen showed operation scars. The stomach and colon were dilated. Constipation was marked, with passage of large quantities of mucus with each motion. The character of the sputum was a peculiar pink mixture, as described by Castellani and Violle, and with minute air bubbles intimately mixed. The amount of blood was always considerably less than it appeared to be, there being quite a large quantity of sanguineous fluid, with the thicker portions floating on the surface.

The microscopic characters of the spirochæte were identical with Case 1.

Treatment.—At first this was directed to the alimentary tract, and then adrenal was given by the mouth in $\frac{1}{2}$ gr. doses twice daily after food. At the end of three weeks severe gastro-intestinal irritation was set up and adrenal was at once discontinued. She soon recovered from this and general treatment was then given for the rest of her stay.

Kharsivan was not given as the patient did not take the suggestion kindly.

In spite of unsatisfactory treatment the general condition of patient improved, and spirochætes diminished considerably in numbers at the time of discharge.

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LOCALITY DIFFERENCES IN THE FEEDING HABITS OF MOSQUITOES.

By Malcolm E. MacGregor,

Wellcome Field Laboratory (Wellcome Bureau of Scientific Research).

Lately it has seemed to me not at all remarkable that there are so many contradictory statements recorded concerning the blood-sucking habits of certain species of mosquitoes. One observer will record the fact that he has never been bitten by a particular species of mosquito: that he has never

met with a specimen with blood in the abdomen; and that in consequence he doubts altogether whether the particular species ever requires a blood meal. I must confess that until recently I was inclined to share this belief as regards *Theobaldia annulata* rather than believe that this species could ever be called a voracious blood-sucker. Innumerable times I have encountered this mosquito in stables, in out-houses of all sorts, and elsewhere; but as far as I can remember I have not until just recently ever been attacked by the species, or seen blood in the abdomen.

At the War Office Entomological Laboratory at Sandwich, Kent, certain stables where we obtained our anopheline supplies often contained large numbers of *T. annulata*, but never once was an engorged specimen seen. Specimens were captured at all times of the year, but none could ever be induced to "bite" in the laboratory, though they were encouraged to do so by day and by night.

This is my experience in Kent: contrast it with the two following experiences in Surrey.

At Wisley, Surrey, where my present laboratory is situated, among the huge mosquito population of the locality, *T. annulata* is widely represented. It breeds in stagnant ditch water, and very largely in rain-tub barrels around houses. The adults enter dwellings in numbers, but although we resided for three months near Wisley, and specimens of *T. annulata* were often in our bedrooms throughout the night, we were never once bitten, nor did I ever find an engorged mosquito of this species.

Within the last week I have moved from Wisley to Woking—from completely country surroundings, to the surroundings of a country town. From the first night of my arrival at Woking I have been repeatedly attacked each night by *T. annulata*, and I have captured engorged females in the mornings three days out of the five that I have searched for them. The mosquitoes exhibited an unusual amount of daring. One evening, after a specimen had buzzed around my pillow until my patience was exhausted, I switched on the electric light suddenly and chased the creature about the room for fully five minutes, but as the walls of the room were high, I decided that the mosquito had the best of it, and went back to bed. In my attempts at capture I had ascertained quite definitely that there was only one in the room, yet the light was no sooner extinguished than it resumed the attack.

During the last few years I have been much impressed, both in England and abroad, by what seems to be locality differences in particular species of mosquitoes.

To confine such experiences to England, let me cite two other rather striking examples.

There are not many records in England of *Culex pipiens* "biting" human beings, although this species is common in houses all over the country. Personally I have tried my best on numerous occasions by day and night to get *C. pipiens* to bite in the laboratory. On one occasion in London, in 1915, a cage containing *C. pipiens* was tied to the forearm of a volunteer and was kept in that position throughout three consecutive nights, yet none of the insects could be got to feed.

Nevertheless about the same time under different conditions, and in a different locality, this same species was attacking workmen so viciously in the Highgate Station of the Underground Electric Railway, 66 ft. underground, that the Company appealed for help in subduing the pest.[1]

The third example which I will quote concerns *Anopheles maculipennis*. In June to September, 1917, I was stationed at Bordon Camp, in Hampshire. *A. maculipennis* was present in large numbers, and I had sometimes counted as many as thirty females resting on the walls and ceilings in our bedrooms at a house in Whitehall district, Bordon. Never once, however, were we attacked.

While residing near Wisley recently, although *A. maculipennis* was at no time nearly so numerous as at Bordon, they attacked me so viciously at night that for a fortnight early in July I had to sleep under a mosquito-net in order to be comfortable.

What underlies these local differences in the habits of mosquitoes it would be difficult to say. In the case I have mentioned with regard to *C. pipiens*, one would be inclined to explain it as a matter of atmospheric temperature, for the temperature of the "dead ends" of the Tube Railways was distinctly tropical. On the other hand, in the case of *A. maculipennis*, it is certainly not a matter of increased temperature that induced the insects to "bite" at Wisley though they did not "bite" at Bordon. I have no temperature charts to consult for comparison of the records of 1917 with the records of this year, but I think it can be safely assumed with the almost continuous wet and cool weather we have had during July, that the average temperature this year for July has not been higher than it was in 1917.

I think a more likely explanation is to be found in the suggestion that possibly it is due to local differences in the normal food supply of the insects. In the Tube there was only one available supply, i.e., human beings. Again, at Wisley, it may have been that there was a shortage in the cattle-blood supply—live stock is certainly scarce in the locality. While in regard to *T. annulata*, whatever its main blood supply may be normally, the supply may be absent for this particular region of Woking.

It is clear, at any rate, that a particular species of mosquito may exhibit differences in its blood-sucking habits in different districts irrespective of the influence of atmospheric temperature, and it is necessary to guard against the likely error of assuming that because the habits are known fully in one locality that these habits are necessarily the same in some other locality.

THE TREATMENT OF ULCUS TROPICUM.

By Nathaniel Crichlow, M.B., Ch.B. (Glasgow.)

Government Medical Officer, British Solomon Islands.

The definition of Ulcus Tropicum, given by Castellani and Chalmers, correctly describes the main features of the ulcer. It is a chronic sloughing ulcer, very

[1] Journal of Tropical Medicine and Hygiene, 1915.

often, in my experience, phagedænic in character, and spreading down to the muscles and bones. It shows little or no tendency to spontaneously heal. The most frequent sites are on the outer aspect of the leg in the lower third and the ankle.

All of the cases I have dealt with were found in natives, and were present for months and even years. They presented a very dirty appearance, and were covered with a thick dirty-grey and foul-smelling secretion. On removing this secretion, the fundus was dark-red in colour and funnel-shaped. The causative organism, in my opinion, is a spirochæte.

Treatment.—Ulcus tropicum is very resistent to ordinary treatment and slow to heal, often taking months to do so. I have never tried methylene blue ointment, as recommended by Mason, or protargol ointment, as recommended by Castellani and Chalmers. The treatment I have found most effective is as follows:—

At the outset, an intravenous injection of galyl is given. Every day the native soaks the ulcer in a bucket containing a hot antiseptic solution for 15 to 30 minutes. Kerol is used, as it is very cheap and answers well. After the hot antiseptic bath, the ulcer is dusted with iodoform powder and a dry dressing applied. When the ulcer presents a clean appearance, the antiseptic bath is dispensed with, and the ulcer is cleansed with an antiseptic lotion such as 1-1,000 corrosive sublimate solution, and then dusted with the iodoform powder. At this stage, "bipp" ointment is sometimes used instead of the iodoform powder.

Under the above treatment, ulcers which have resisted treatment for months heal in from 14 to 28 days. I have had no occasion to repeat the injection of galyl, as one injection in all my cases was sufficient. Galyl, in my hands, has proved so wonderfully effective, that I have no hesitation in recommending it as a routine treatment in all cases of tropical ulcers.

The Defects of Deficient Dietaries in Monkeys. (McCarrison, *Brit. Med. Journal*, February 21, 1920.)

Some of the author's conclusions are as follows:—

"Dietaries which are deficient in vitamines and in protein, and at the same time excessively rich in starch or fat, or in both, are potent sources of disease, and especially of gastro-intestinal disease.

"An excess of fat, in association with deficiency of 'B. vitamines' and protein and superabundance of starch, is peculiarly harmful to the organism.

"Certain dietetic deficiencies greatly favour the invasion of the blood and tissues by bacteria."

Œdema as a Symptom in Food-deficiency Diseases. (Bigland, *Lancet*, January 31, 1920.)

The author mentions three possibilities as to the mechanism of œdema production in such cases:—

(1) Toxic products of albuminoid metabolism may damage the endothelial linings of the vessels; (2) deficiency in calcium salts; (3) increased production of adrenalin causing increased intracapillary pressure.

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FRUITS AND THEIR SALTS.

A VAGUENESS amounting to ignorance exists amongst us as to the part played in the economy by the salts which exist in dietary articles in common use, more especially in the fruits and vegetables we consume. Some of these agree with certain individuals whilst others find them

actually dangerous. We are familiar with the effect of rhubarb, for instance. Oxalates are known to take a prominent part amongst its ingredient salts, and with many people this fact renders table rhubarb prohibitive eating. The writer can speak from personal experience; on three separate occasions he has passed oxalate calculi from the left kidney, and on one occasion from the right. There could be no doubt about the incident, for each attack was attended by acute agonizing pain over the kidney on one side, and with a sharp occurrence of hæmorrhage. Being abroad for a time where edible rhubarb was not to be had, no more attacks occurred, but on returning home and when again eating rhubarb the left kidney was the seat of violent pain which died away in the course of two or three days. Aware that the trouble was due to rhubarb and its oxalates no more was eaten for twelve months, in fact until the young rhubarb came into vogue again in the following spring. Anxious to test whether he had recovered from the rhubarb idiosyncrasy he took it again, but the pain returned in the left kidney.

For seven years in succession the experiment was repeated and for all the seven years the same concordance of events happened. Since avoiding further experiment no recurrence has taken place. What are the physiological and pathological traits in this sequence? Do some people possess congenitally smaller kidney tubules than others and thereby suffer in consequence by the passage of oxalates, or are the oxalates of rhubarb and other plants changed by the absence of something amiss with the digestion of these salts, or is the digestion such that oxalates of a larger calibre are produced? We are, at least most of us, hazy as to the actual cause of the presence of oxalates in such quantity, and are content to believe that it is due to "indigestion," that whirlpool of evil into which so many unsolved problems are cast. If due to indigestion, what faulty process in that complex entity is amiss? In our chemical text-books we read that oxalates are met with in addition in such plants as wood-sorrel, the common dock and certain lichens. No mention is made of tomatoes in the category, perhaps because the tomato of our tables is more recent, and the fact that it is also impregnated with oxalates has not come to be so generally known. The tomato, once known as the "love-apple," was, when under that designation, small, shrivelled, crinkled and unattractive, but by the genius of Mr. Adam Duncan—just deceased—smooth-skinned globular fruit, now so popular, was evolved. In earlier days it was a mere table decoration, now under its present and perfected form it has become a popular article of diet. With those to whom rhubarb is anathema tomatoes also produce similar untoward effects. Now and again there crops up the legend that tomatoes cause cancer. It is very foolish of course, but if cancer is in many cases due to irritation, the crystals of oxalates are irritating to a degree to the whole length of the urinary tract. Oxalic acid itself is an artificial product and does not exist in nature. It can be produced experimentally in the purest form by boiling nitric-acid and loaf sugar together for a time. Sufferers from the oxalate diathesis are markedly fond of sweets and are invariably dyspeptics. In practice we give acids as a rule and nitro-hydrochloric acid by preference. Does this acid taken immediately after a meal, in which sugar—whether in tea, coffee, &c., or in stewed fruit, milk puddings, or as "sweets"—is freely taken, act upon the oxalate of lime in rhubarb, tomatoes, and in dozens of other fruits and vegetables in quantity, and set free the oxalic acid and cause a form of poisoning, slight it may be, but sufficient perhaps to account for some of the symptoms which afflict dyspeptic people? This may seem far fetched and a chemical impossibility. The writer is not deterred thereby from mentioning these points for any such contention. Physiological chemistry is not so precise as to frighten us from such tenets, viz., that what is true in the chemist's laboratory may not be the case in the living organism. As we discuss opsonins in the pathological field of research, that is that cells are stimulated to activity by certain substances, be they chemical or vital, so may salts in the presence of others afford results which are not met with when these salts are dealt with singly in the laboratory. Speculation in this direction lands us in an illimitable field of complex investigation which by its enormity seems too appalling to enter upon.

Nor is the subject limited to substances pronouncedly impregnated with oxalates. Others there are, such as gooseberries. When a large quantity of these are consumed there occurs in many people a peculiar form of "poisoning" characterized by swelling and fullness of various parts, best seen in the face, hands and feet. The face becomes puffy, the lips swollen, the features lose their characteristic lines and folds, the fingers become swollen and stiff, and it is impossible to clench the fist properly; the feet become uncomfortable, demanding removal of the boots for relief, and the person so upset has to lie down for some hours owing to a feeling of being "overcome." In a day or two the "feeling" and the symptoms disappear. Strawberries, to a person with an oxalate diathesis, cause discomfort in the lumbar region if many are eaten, and in those of a uric acid temperament they are regarded as "forbidden fruit." Yet in certain ailments such as sprue—a disease characterized by intense anæmia, diarrhœa, wasting of the muscles and shrinking in size of all abdominal organs—strawberries can be consumed in enormous quantities with the greatest benefit. The writer has seen a helpless case of sprue, that is one in which death seemed at hand and in which all forms of known treatment had failed, consume as many as twelve pints (or pounds) of fresh strawberries a day, and in a week become practically a sound man, and at the age of 65 (an almost unheard of age to recover in sprue) get quite well and return to the tropics (Manilla) and resume work. To persons afflicted with oxalates or uric acid strawberries are anathema, whilst on the other hand, to persons suffering from anæmia—sprue-anæmia, a condition akin to pernicious anæmia and well-nigh indistinguishable microscopically—they are curative to well-nigh a miraculous degree. So far but some half-dozen of substances have been mentioned: were the growth of the groups of tartrates, citrates, glucosides and many more such brought into the discussion the subject would assume illimitable dimensions. Tar-

trates exist in the juice of many fruits, but it is from the grape that our supplies are usually obtained. This involves the subject of brandy, and all natural wines of which the variety is legion. Grapes eaten in fair quantity cause in some people kidney discomfort, frequency of micturition and a feeling of sickness and repulsion to grape eating.

Whilst grape-juice is fermenting in the process of wine-making, the acid tartrate of potassium, not very soluble in aqueous liquids, is still less so in spirituous and hence crystallizes out as the sugar of the grape juice is gradually converted into alcohol. There is nothing so confusing, so perplexing to the young practitioner of medicine as the question of wines. He has had no instructions in this subject in his medical student career. He may he suddenly asked what he thinks of, say, sparkling moselle as a heverage by some elderly man or woman, the subject with a gouty tendency. He may never have heard of such a wine, and as to its probable effect upon his patient it is a closed hook. He shuffles out of the dilemma as best he may, seeks for information upon the wine in question, but can think of no book where he can gain it, and should he ask a brother practitioner will receive in reply mere generalities of no practical value. Is there a hook published which imparts even a superficial knowledge of the kind he requires? Opinions there are in plenty, but of accurate scientific knowledge there is none obtainable. It may be "Pussyfoot" legislation may free him of the necessity for acquiring such information on such subjects, and some doctors, so perplexed are they when asked for a definite opinion on such and such a wine in preference to another, that they may even hope the ridiculous mania of a dry country may come to pass.

The doctors to whom people fly for advice on the subject of food or drink have no real education in either; a condition of things which turns out practitioners ill-equipped in the real basis of the treatment of disease.

May we hope that such a course of instruction will ever be given, or are we to listen only to the evils caused by alcohol in any form, and how it fills our asylums with a lunatic progeny? Will no one tell us how wines, &c., behave in the economy; their scientific bearing upon health and disease; the actual part they play, if they do play a part, in gout; their adulteration with many obnoxious substances, and the difference between bad and good wines—the knowledge we possess is not scientific in any sense, it is mere gossip—the therapeutic value of wines of different kinds and the suitability of such and such a wine in varying diatheses? Most people favour "dry champagne." "Sec and Extra Sec" wines are regarded as safe in gouty folk. Yet gout is an acid plethora in the blood: and acid or dry, or sec champagne, that is wine to which hydrochloric acid is added by the French on purpose to please the English taste—such wine is adding but fuel to the fire, acid in the wine to an economy already loaded with acid: a condition of things which carries its own punishment.

The French do not drink "sec" champagne, but wine that is neither sweet nor acid, but neutral. This wine does not cause headache next morning, nor does it produce gout.

Annotations.

On the results obtained by the Weil-Felix Reaction for Typhus Fever at the Garrison of Baku during the period March—July, 1919, *inclusive* (F. E. Reynolds. *Journal of the Royal Army Medical Corps*, vol. xxxv, No. 1, July, 1920).—From a long series of investigations the author concludes that:—

(1) Agglutination obtained by serum in dilution 1/100 indicates typhus fever.

(2) After about the eighth day from onset of the disease, if no agglutination is given by the serum in dilution 1/100, acute typhus fever is excluded.

(3) A positive reaction is given by the serum for a varying number of weeks after an attack of typhus fever. There is no relationship in different cases between the time after the attack and the agglutination titre of the serum.

Toxic Jaundice in Patients under Antisyphilitic Treatment (C. V. Bailey and A. Mackay. *Archives of Internal Medicine*, vol. xxv, No. 6, June 15, 1920, p 628).—From a chemical study of the blood and urine it was found that in patients whose livers are damaged by arsenobenzol derivatives hypercholesteroluria is an early and marked sign which persists after other clinical signs have disappeared, and its routine estimation may be of value in detecting the onset of liver injury in patients under antisyphilitic treatment. In debilitated patients, particularly if the liver is disordered, the oxidative activity of the urine is diminished. In such cases the oxidative activity is greatest during absolute rest, hence exercise should be restricted greatly during the course of antisyphilitic treatment, and for the following few weeks.

A diet rich in carbohydrate and very low in fat and protein should precede, accompany, and succeed the administration of arsenobenzol derivatives in the treatment of syphilis. Increase of protein in the diet and exercise should be controlled by the estimation of urea in the blood.

The appearance of toxic symptoms in delayed poisoning by arsenic, phosphorus, chloroform, &c., is possibly due to the premature increase of protein in the diet and of exercise.

Current Literature.

THE INDIAN MEDICAL GAZETTE, June, 1920.

Standard Diets (J. A. Shorten).—In this interesting lecture, delivered at the Calcutta Health and Child Welfare Exhibition, the author gives the following diet rules:—

(1) Avoid a one-sided diet, remembering that you require proteins, fats, carbohydrates, and accessory food factors.

(2) As good digestion is said to follow appetite, have your food cooked to satisfy your tastes and desires.

(3) In the case of children, remember the import-

ance of fat-soluble "A," and give fresh milk, butter and eggs.

(4) Remember the value of wholemeal flour and unpolished rice when flour and rice form the main articles of your dietary.

(5) Remember the anti-scorbutic value of fresh vegetables and fruits. Fresh vegetables, such as salads, can be made safe by simply scalding in boiling water or using some simple disinfectant such as Condy's fluid.

(6) Do not boil your vegetables for too long a time, and, above all, do not add soda to soften them.

Typhus and Typhus-like Fevers in East Persia (A. S. Fry).—Clinical notes on nine cases of fever, with symptoms identical or very similar to typhus.

An Outbreak of Relapsing Fever in Turkey (Clive Newcomb).—The outbreak first made its appearance in April, 1918, and continued till June. Neosalvarsan was used with very good results.

Notes on Influenza (J. H. McDonald).—The author gives importance in the ætiology of the disease to a bacillus belonging to the Friedländer group, which was isolated in pure culture from pleuritic effusions following an attack of influenza.

THE INDIAN JOURNAL OF MEDICAL RESEARCH, Vol. VII, No. 3, January, 1920.

Estimation of Erythrocytes and Hæmoglobin Content of Blood.—W. F. Harvey describes a method of estimating the volumetric content of erythrocytes in the blood by means of capillary pipettes and one for obtaining the concentration of erythrocytes in the blood by measuring the tint and turbidity in a tinturometer. The same instrument may also be used for the estimation of hæmoglobin after taking the blood with N-10 hydrochloric acid.

On the Use of Birds as Laboratory Animals.—W. F. Harvey finds that birds can satisfactorily take the place of the rabbit in the production of high-titre agglutinating sera, but are not suitable for the production of anti-sheep hæmolytic sera.

A Bacteriological Investigation of Influenza.—R. H. Malone found heated pigeon's blood agar the best medium for the isolation and identification of *Pfeiffer's bacillus*. From the sputum of influenza patients he obtained :—

Pneumococcus	in 96	per cent.
Streptococcus—		
(*a*) *Viridans*	in 63	
(*b*) Non-hæmolytic non-pigmented	in 16 } 86	,,
(*c*) Hæmolytic	in 7	
Pfeiffer's (heated pigeon's blood agar)	in 78	,,
Diphtheroids (heated pigeon's blood agar)	in 32	,,
Catarrhalis group	in 28	,,
Staphylococcus aureus	in 13	,,

The pneumococcus was the only organism isolated from the blood. In the cerebrospinal fluid the *Diplococcus intracellularis* was isolated from seven cases tentatively diagnosed as influenza with meningeal symptoms; otherwise the pneumococcus was the only organism isolated. From the accessory respiratory sinuses *P. bacillus* or the pneumococcus was isolated in every case save one. The blood serum of influenza patients infected with *P. bacillus* agglutinated the homologous strain in 82 per cent. and heterologous strains in 42 per cent. Mouse inoculation proved a satisfactory method for recovering *P. bacillus* from the sputum.

The Production of Indole by Pfeiffer's Bacillus (R. H. Malone).—*P. bacillus* was the only hæmophylic organism found in the respiratory tract of influenza patients and of healthy persons which produces indole when grown in suitable culture media. The indole reaction can therefore be used as a means of identifying *P. bacillus* in pure cultures and recognizing its presence in mixed cultures, and should also serve as a rapid and easy means of detecting "carriers" in a healthy population.

Lethargic Encephalitis in Karachi during an Epidemic of Influenza (R.H. Malone and G. C. Mitra).—In ten cases of lethargic encephalitis which occurred in Karachi during the present influenza prevalence there was no history of an attack of influenza, and in one case only was there influenza in the family during the present epidemic. No light was thrown on the ætiology of the disease, and there was no evidence that it is contagious. Examination of the blood revealed a moderate leucocytosis with an increase in the polymorphonuclear cells. As the patient recovered a decrease in the polymorphonuclear neutrophiles and a relative increase in the eosinophiles and small monocysts was found. The cerebrospinal fluid was clear and contained an excess of globulin, and there was no increase in its cell content.

The Preparation of a Culture Medium suitable for the Growth of Organisms used as Vaccines.—D. Norris recommends the use of a caseinoger broth for this purpose.

Preliminary Notes on a Method of Utilizing the Natural Amboceptor in Hæmolytic Sera in the Wassermann Reaction.—R. B. Lloyd and G. C. Mitra estimate the amount of natural amboceptor present in the serum, and then put up the volume of serum with antigen and complement and no antigen and complement respectively, controlling these with no serum plus antigen and complement. With non-syphilitic sera hæmolysis occurs in all three tubes, and inhibition in the first tube means a positive result.

(1) *Bionomics of Houseflies.* I. Outdoor Feeding Habits of Houseflies, with Special Reference to *Musca promisca* (P. R. Awati). (2) II. Attraction of Houseflies to Different Colours (P. R. Awati). (3) III. A Preliminary Note on Attraction of Houseflies to Certain Fermenting and Putrefying Substances (P. R. Awati and C. S. Swaminath).

Houseflies were found to respond to different colours both by day and night. Yellow had the greatest attraction, red and violet the least; blue, green and orange being intermediate. Some strong-smelling substances connected with putrefaction, such as ammonia, sulphuretted hydrogen, compounds of phosphorus, &c.,

attracted houseflies but did not cause them to deposit their eggs.

On the Occurrence of Coleoptera in the Human Intestine (R. A. Senior).—The fæces of a Sinhalese boy, aged 4 years, who suffered from slight pyrexia, cough, pain in the abdomen, and soft stools, contained living imagines of *Orthophagus bifasciatus* after the administration of an anthelmintic. Though seldom or never serious, the condition is sufficiently common to have a vernacular name in Sinhalese, viz., Kurumini standāmā (lit., beetle-disease). The method of invasion is obscure.

(1) *The Correlation between the Chemical Composition of Anthelmintics and their Therapeutic Values in connection with the Hookworm Inquiry in the Presidency of Madras.* II. *Oleum Chenopodii.* (2) III. *Oleum Absinthii.* (3) IV. *Oleum Tanaceti.* (F. J. Caius and K. S. Trihaskar).—American cotton-seed oil (*oleum chenopodii*) has long been in vogue in that country as a household remedy for worms, particularly for ascarids. The authors have found it to be a mixture of several constituents which are present in varying proportions. It deteriorates with age and may easily be adulterated. It is highly toxic. It is a powerful vermicide, acting both on ankylostomes and on necators. The toxic and vermicidal properties reside in the same active principle—ascaridol—and are interdependent. The optimum dose is different for every sample, and there is no accurate and simple method of determining it. There will thus always exist an element of doubt as to the safety and efficacy of the treatment. Oil of wormwood (*oleum absinthii*) and oil of tansy (*oleum tanaceti*) were found to possess very slight anthelmintic properties.

Note regarding Malaria in Kashmir (C. A. Gill).—Except altitude no factors can be found to account for the freedom of Kashmir from malaria. The absence of malaria in localities having an altitude of 6,000 feet or over, especially in view of the presence of malaria carrying mosquitoes, suggests that the critical altitude is between 5,000—6,000 feet, which is the average height of the Kashmir valley. The significance of altitude in relation to malaria is thus worthy of more extensive investigation.

The relationship of Malaria and Rainfall (C. A. Gill).—In all malarious countries there is a general association between rainfall and malaria, yet no constant relationship was found to exist between excessive rainfall and the incidence of autumnal malaria at Amritsar.

The Pathogenesis of Deficiency Disease: X. The Effect of some Food Deficiencies and Excesses on the Thyroid Gland.—R. McCarrison found that dietaries deficient in vitamines lead to a reduction in size and weight of the thyroid gland, rendering it susceptible to the noxious action of intestinal bacteria and their products, with resultant atrophic and necrotic changes. Dietaries containing adequate provision of vitamines and rich in proteins and fats induce hyperplasia of the thyroid, which is retarded by the ingestion of onions. It is therefore suggested that *succus alii* might prove of benefit in retaining the thyroid hyperplasia of Graves's disease.

Changes in the parathyroids are also induced by a diet deficient in vitamines and rich in starch and fat. They appear to be due to the action of intestinal anaerobes, the noxious action of which is favoured by the defective diet.

Secretion and Epithelial Regeneration in the Mid-intestine of Tabanus.—F. W. Cragg describes in detail and illustrates the cellular changes which are associated with the processes of digestion and absorption of food in the mid-intestine of Tabanus, and suggests that similar processes occur in the mosquito in view of the close relation of the two families and their general similarity in structure and habits.

Abstracts.

HITHERTO UNDESCRIBED SIGN IN DIAGNOSIS OF LETHARGIC ENCEPHALITIS.

By Thomas F. Reilly, M.D. New York.

While there is no great difficulty in arriving at a diagnosis in the cases of encephalitis presenting a history of double vision, ptosis and other cranial nerve phenomena, a not inconsiderable number of patients are encountered in hospital practice who are brought in unconscious or delirious, and from whom no such history is obtainable. In such instances the patient presents a picture closely simulating that of one in the third week of typhoid fever. There are no focal symptoms pointing to a local central lesion. The leukopenia, so frequently present, is also strongly suggestive of typhoid fever.

In children the picture is almost identical with tuberculous meningitis. I have noticed in the majority of cases of encephalitis a sign that is very startling when recognized. It consists of a rhythmic convulsive twitching of the muscles of the abdomen in the neighbourhood of the eighth and ninth ribs. It often simulates the muscular movement of hiccough, except that it is one-sided. It has been present in the mild as well as in the severe cases, although in two patients it was not elicited when I observed them.

The term "lethargic" is unfortunate, as many of the patients having encephalitis are never lethargic; on the contrary, they are frequently delirious and often have choreiform movements of the limbs.

In some cases there are almost no cerebral symptoms, not even the ordinary placidity; in others a curious fear and apprehension may be evident, and again the patient presents only the painful sensations of an ordinary neuritis confined

[1] Abstracted from the *Journ. Amer. Med. Assoc.*, vol. lxxiv, No. 11, March 13, 1920, p. 735.

to certain peripheral nerve tracts, the central origin of which is evident by reason of its rapid transference to other regions of the border.

Often in these doubtful cases the convulsive twitching mentioned above is the only symptom that may serve to suggest that the patient is suffering from encephalitis.

It may be too early to regard this symptom as of absolute diagnostic value; but it has been present so frequently in the cases that I have observed that I am certain that it is at least a strongly suggestive sign.

TREATMENT OF THE TOXIC REACTIONS WHICH FOLLOW THE INTRAVENOUS INJECTION OF "914."[1]

By Surgeon Lieutenant-Commander R. J. G. Parnell, R.N.

The Cause of Toxic Symptoms.

P. Fildes and I have expressed our views in a recent publication as to the origin of these reactions. We do not support the view commonly expressed that the toxic reactions are due to an accumulation of arsenic from a too rapid succession of doses. According to this theory, the subsequent doses should be more and more toxic, instead of less toxic. As a matter of fact, we found that a reaction after the third dose was less likely to occasion one after the fourth, and after further doses there was a marked diminution in the number of toxic reactions. Our observations rather suggested that the susceptible structure of the body, the "intoxication" of which causes symptoms, cannot be "intoxicated" again until an interval of recuperation has occurred. The tissue is, in fact, no longer susceptible; it may be said to be desensitized. On the other hand, it appeared to us probable that these toxic symptoms are due to an optimum concentration of "914," or some derivative of "914" in the tissues. If this is too high or too low (within limits), no intoxication occurs. The concentration may be governed by variations in the rapidity of excretion.

The Prophylaxis of Toxic Reactions.

Too much emphasis cannot be laid on the importance of a thorough physical examination of the patient before treatment.

Abnormalities of the urine, visceral lesions, aortitis and arterio-sclerosis call for special caution in dosage. Intensive courses which can be given with impunity to the majority of young "fit" men are not suitable for men over 40.

The question of "water-fever" does not arise in this paper, yet I think it advisable to insist on the adoption of great precautions in the preparation of the water, since impurities of water may increase the toxicity of the drug.

Attention to all these points should eliminate the preventable causes of disaster. A syringeful of adrenalin (1/1,000) should always be prepared before injections are commenced. Oxygen should be obtainable at short notice. Lumbar-puncture needles and the necessary implements for phlebotomy may be required.

[1] Abstracted from the *Journal of the Royal Naval Medical Service*, vol. vi, No. 2, April, 1920, p. 130.

PRELIMINARY REPORT OF EXPERIMENTAL INVESTIGATION OF SCURVY IN THE ROYAL NAVY.[1]

By Surgeon Captain P. W. Bassett Smith, C.B., C.M.G., F.R.C.P., F.R.C.S., R.N.

Following up the very valuable work done at the Lister Institute, and recognizing the futility of the issue of ordinary lime juice as previously supplied to the Navy, I have been experimenting for the last four months to provide an anti-scorbutic which is efficient, portable and palatable.

Many observers have shown that lemon juice and orange juice have large accessory factor contents for scurvy, particularly when used fresh, but this is not very stable, being rapidly destroyed by heat, diminished by alkalies and by time.

Givens and McClugage have shown that dried orange juice can be prepared, and is effective for a considerable period.

In the investigations carried out at the R.N. Medical School, Greenwich, various methods of preparing the juice were tried: Evaporation at 60° C., de-acidification, impregnation on filter-paper, and so on. The final method evolved, and which is in continuous use, is as follows:—

The juice is roughly filtered through muslin, and then through filter-paper under reduced pressure. The filtered juice is evaporated *in vacuo* over sulphuric acid at ordinary temperature (15° C.). The residue of non-crystallizable syrup is worked up into as stiff a paste as possible with a mixture of anhydrous lactose, 97 per cent.; gum tragacanth, 3 per cent. The paste is cut into sections, each containing the juice of half a lemon. These are rolled, faced with the mixture, and pressed to assume the lozenge form. These tablets have been kept at ordinary temperature and at 37° C. for months, and are being used for the experiments.

The tablets dissolve fairly readily if added to water containing a small quantity of bicarbonate of sodium.

Guinea-pigs used in the experiments are given one-fifth of a tablet, i.e., one-tenth of the juice of a lemon daily, or 4 c.c.; but one-tenth of a tablet (equal to 2 c.c. of fresh juice) has protective action.

First Series.—A basal diet of oats and bran, plus 60 c.c. of milk which had been previously sterilized in the steamer for one and a quarter hours, and an abundance of water was given. Control animals died about the fortieth day, and scurvy signs were evident. Further controls, with

[1] Abstracted from the *Journal of the Royal Naval Medical Service*, vol. vi, No. 2, April, 1920, p. 117.

an addition of (*a*) fresh de-acidified lemon juice, and (*b*) raw fresh cabbage, grew normally. Those on the tablet at first ceased to grow, then their weight increased, and after three months they remained perfectly healthy.

Second Series.—A basal diet of ship's biscuits, 30 grm., sterilized milk, 60 c.c., and lime water, 20 c.c., was given.

Diet contains 144·80 calories, assuming complete digestion. A change of diet to bran and oats was given once a week. The control animals on this diet died about the fortieth day from scurvy, and those with an addition of raw cabbage grew normally.

The animals on one-fifth of a tablet grew, and after three months are normal; those on the same amount of tablet which had been stored for months at room temperature are doing equally well.

The animals are at first hand-fed with the tablet, but generally later will eat it readily. The tablets kept at 37° C. darken markedly in colour, probably due to caramelization of the lactose, and it is more difficult to get the animals to eat them. There is no reduction of the acid content after storage. It has been shown that 5 c.c. of fresh lemon juice is sufficient to prevent scurvy in infants.

The adrenal glands of all the animals which have died with scurvy signs have shown enlarged and hæmorrhagic changes, with atrophy of intestinal tract, but no marked cæcal distension.

It would seem that this method of preparation, in which heat is not used, provides an efficient, portable, and palatable compound, rich in anti-scorbutic vitamine, and one which appears to retain its potency at ordinary temperatures.

A REPORT ON THE GYNOCARDATE AND MORRHUATE TREATMENT OF LEPROSY BASED ON FORTY CASES TREATED IN THE KASHMIR STATE LEPER HOSPITAL.[1]

By Ernest F. Neve, M.D., F.R.C.S.E.

We owe the introduction of chaulmoogra oil for the treatment of leprosy to Le Page of Calcutta. It was favourably reported on by Bevan Rake, who mentions a case in which $\frac{3}{4}$ to $1\frac{1}{4}$ drachms were administered internally daily for six years with great benefit. He also recorded eighteen cases in which, under this treatment, he noted improvement of sensation and diminution of tubercles. For, in 1890, reported a case in which, between 1884 and 1890, a leper treated with this oil had completely recovered. Rennie and Carter also observed marked improvement after internal administration of chaulmoogra oil. In India, systematic treatment was carried on in Madras with oil pressed from the seeds of *Gynocardia odorata* (*Hydnocarpus odoratus*), 2 gr. of which were given twice daily in an ounce of milk, and it was claimed that anæsthesia cleared up and the skin became smoother.

In 1913 four cases were reported in the United States of America as having been apparently cured by chaulmoogra oil treatment. In two of these the remedy had been used hypodermically. Victor Heiser, Director of Health for Philippine Islands, then tried a filtered mixture of chaulmoogra oil, camphorated oil and resorcin, 4 grm. of the latter and 60 c.c. of each of the former. This was given hypodermically in 1 c.c. doses, gradually increasing at weekly intervals. He treated twelve cases, some of them for two years, and in some cases doses of from 5 to 10 c.c. were ultimately reached. He claimed improvement in every case, and in 55 per cent. practical cure.

Encouraged by Heiser's apparent success, Sir Leonard Rogers, who had previously obtained good results by oral administration of large doses of gynocardic acid, now determined to try the intravenous use of soluble sodium gynocardate. After obtaining the assistance of Dr. Sudhamoy Ghosh in the investigation of the hydnocarpus fatty acids and their melting points, Sir Leonard Rogers decided to limit his trials to the *Taraxtogenos kurzii*, and he had a solution made of the sodium salts of mixed hot and cold pressed oil of a strength of 3 per cent., 1 gr. of the salts being present in 2 c.c. of the sterilized carbolized solution.

In October, 1917, Sir Leonard Rogers published details of twenty-six cases injected with sodium gynocardate and chaulmoograte. While all his cases showed some improvement, those subjected to treatment for upwards of a year gave the best results. Indeed, eight out of twelve are classed as lesions disappeared.

In June, 1918, Muir, of Kulna, published a report on thirty lepers treated with this solution, and in April, 1919, he brought the record up to date, and added notes of twenty-three other cases. He records rapid improvement in many of his cases, especially in early cases and children.

Sodium morrhuate, prepared from cod-liver oil, we also owe to Sir Leonard Rogers; it has one great advantage over the gynocardate, for it can be used subcutaneously. Twice a week a dose of $\frac{1}{2}$ c.c. is given, and gradually increased by a $\frac{1}{2}$ c.c. until 4 c.c. is reached. The large doses may be given only once a week. Sir Leonard Rogers has recorded several cases which showed marked improvement under this treatment.

In 1919 we selected forty cases of nodular or anæsthetic leprosy. Those who were debilitated were excluded. Twenty were treated with intravenous injections of gynocardate and twenty with subcutaneous or intramuscular injections of morrhuate of sodium.

Commencing with 1 c.c. twice weekly, the method has been gradually to increase till the large doses are reached and then to administer it once a week.

Our cases were very chronic, and most of them, it may be added, very severe. The milder cases do not care to come to a hospital where there are so many bad cases.

[1] Abstracted from the *Indian Medical Gazette*, vol. lv, No. 4, April, 1920, p. 128.

Each case was photographed at the beginning of the special treatment. In estimating improvement a careful comparison is made with the print.

About half the cases treated showed distinct signs of improvement. Seeing that this is so, it is curious that so many of the others failed to respond in the same way. Of course, to some extent in these cases of some years' standing the conditions of cure have ceased to exist. Deformities, the loss of fingers and toes, contractures, muscular atrophy, deposits of fibrous tissue causing pressure, atrophy of neurones and cicatrices cannot be expected to clear up. For this reason it would appear that nodular cases have benefited more than those of old standing anæsthetic leprosy.

The general results of the two methods of treatment may be tahulated as follows:—

GYNOCARDATE TREATMENT.

Much improved	... 2	Improved	... 7
Percentage	... 10	Percentage	... 35
Not improved	... 11		
Percentage	... 55		

MORRHUATE TREATMENT.

Much improved	... 2	Improved	... 6
Percentage	... 10	Percentage	... 30
Not improved	... 12		
Percentage	... 60		

Most of the cases are very chronic, and they have been under treatment for less than a year, so the results may be considered as encouraging. Many of the patients are most unwilling to undergo continued treatment with injections. The gynocardate pills are likely to he specially useful in those cases in which for any reason the treatment is interrupted and also as a supplement to the intravenous injection.

CONCLUSIONS.

1. On an average treatment of six months, about half the cases appear to derive benefit from the gynocardate and morrhuate treatment.

2. Those not definitely improved appear to remain stationarv. Only about 10 per cent. show fresh manifestations of disease while under treatment, some of which have been due to the freeing of toxins by over-action of the drug.

3. Laryngeal and ocular leprosy require great caution in the exhibition of these remedies.

FATAL MOUSE TYPHUS IN A HUMAN BEING.[1]

THE Loeffler mouse-typhus bacillus is morphologically, culturally, and biologically akin to the *paratyphosus* B, from which it differs chiefly in its pathogenicity toward the mouse. Experiments many years ago appeared to show that mankind is immune to this organism. Later, however, it was realized that it could attack men, and mass infections have resulted from the consumption of contaminated flour, the flesh of sick horses, &c., the symptoms being those of gastroenteritis. At least seven fatalities have been recorded.

Staub, an assistant at the clinic of Professor Stahelin, at Basle, has reported a case in the *Schweizerische medizinische Wochenschrift* for February 5, 1920, i, 6. The patient, a man of 62, ate some potato which was covered with mouse poison in the shape of cultures of mouse-typhus bacillus intended to destroy these animals. He later complained of vertigo and prostration and vomited repeatedly. The physician found him asleep, and when roused with difficulty he staggered, behaving exactly as if drunk. The pupils were extremely narrow. He was given some coffee. Next day the pulse, previously good, became rapid and weak, and digitalis was ordered. Constipation had set in from the first and castor oil was followed by persistent diarrhœa. There was no fever. The patient arrived at the hospital on the third day of the disease and was somnolent, highly emaciated, prostrated, and cyanotic, the blood pressure being 90. The emaciation, cyanosis, thirst, rice-water discharges, and other symptoms were decidedly choleriform. The highest temperature was 37·3° C. (99·1° F.) in the axilla. There was no response to treatment and the fatal exit took place on the fourth day after swallowing the poison. Section showed marked congestion of the gastroenteric tract. Pure cultures from the blood would ordinarily have passed for the *paratyphosus* B, but when tested on mice along with the culture used on the potato proved to be the *Bacillus typhi murium* of Loeffler.

Characteristic of the disease is the extremely brief incubation period of about ten hours, the severe watery diarrhœa setting in on the third day, and the acute dehydration and absence of fever. In other words it mimics closely the choleriform type of *paratyphosus* B infection, otherwise the form of cholera morbus due to that germ, the autopsy finding also agreeing with that affection. Commercial mouse poison should therefore be placed officially amongst the substances dangerous to man.

[1] Abstracted from the *Medical Record*, vol. xcvii, No. 14, whole No. 2,578, New York, April 3, 1920, p. 570.

A CLINICAL METHOD OF DETERMINING THE TYPE OF THE INFECTING MENINGOCOCCUS IN CASES OF CEREBROSPINAL MENINGITIS.[1]

By Major A. S. GORDON BELL, R.A.M.C.,
Of the Central Cerebrospinal Fever Laboratory.

IF the standard method of agglutination at 55° C. be employed seventy-two hours generally elapse between the lumbar puncture and the type being determined.

With the rapid method herein described, twenty to twenty-four hours only are needed to type; homologous curative serum can then be given. The advantage is obvious.

TECHNIQUE.

Use a pipette made from glass tubing, drawn to

[1] Abstracted from the *Journal of the Royal Army Medical Corps*, vol. xxxiv, No. 4, April, 1920, p. 379.

a very fine point and fitted with a teat. On a glass plate drop one drop of each of the four type sera; along each side of these drop an equal volume of the emulsion of the coccus under examination; this should be 40,000 millions to 50,000 millions per cubic centimetre. Mix and examine the four pools with a watchmaker's glass. Type is indicated by the pool in which agglutination first appears.

(*a*) After five minutes if a negative result obtain, arrange the serum on the plate thus:—

Type I	Type II	Type III	Type IV
2 drops	2 drops	2 drops	2 drops
3 ,,	3 ,,	3 ,,	3 ,,
4 ,,	4 ,,	4 ,,	4 ,,

To each of these pools of serum add a drop of emulsion, mix and examine as before.

(*b*) If the result is not specific, i.e., agglutination appears in two pools within two minutes of each other, vary the emulsion thus:—

3 drops	3 drops	3 drops	3 drops
6 ,,	6 ,,	6 ,,	6 ,,
12 ,,	12 ,,	12 ,,	12 ,,

To each of these add one drop of Type I serum in the first vertical row, one drop of Type II in the second row and so on. Mix and examine as before. Agglutination will no longer appear with the heterologous serum. If there is agglutination with both I and III and a specific reading cannot be obtained, the type may be called provisionally I, as the Type I serum, so far as I know, is specific.

(*c*) If there is not sufficient growth to allow of a 40,000 million emulsion, take a few drops of saline, pick off colonies and make an emulsion. Now instead of a pipette use a platinum loop to make the several mixtures.

General Rules.

(1) If the coccus has been grown on blood, get rid of as much as possible of this before making the emulsion.

(2) Always kill the coccus at 65° C. before testing.

(3) In the end agglutination will generally appear with all four type sera and even with the normal serum. This agglutination may be disregarded. Again, if by varying the emulsion specificity cannot be obtained, and at least one minute does not elapse between the agglutination by two sera of different types, the result should be disregarded and the patient treated with pooled serum till the type can be determined by the usual slow method.

(4) Always confirm results by the slow method at 55° C.

Results of Laboratory Tests.

With fifteen laboratory specimens of Type I:—

Correct answers	Negative	Incorrect
13	1	1

With twenty-five laboratory specimens of Type II:—

Correct answers	Negative	Incorrect
24	1	—

With twelve laboratory specimens of Type III:

Correct answers	Negative	Incorrect
12	—	—

With seven laboratory specimens of Type IV:—

Correct answers	Negative	Incorrect
4	3	—

As Type IV is so relatively rare this is of small account.

With fourteen recent cases of cerebrospinal fever a correct answer, as subsequently confirmed by the slow method, has been given in twelve; one was negative and one wrong.

All these results were obtained in under twenty-four hours after lumbar puncture.

This method is at present no use in typing cocci obtained from post-nasal swabs, as agglutination has been known to take place with Gram-negative nasopharyngeal cocci which do not absorb and therefore are not true meningococci.

Too much weight must not be laid on the results obtained with laboratory specimens, as experience has shown that meningococci under prolonged culture on egg and trypagar media may tend to become more specialized than when recently isolated.

The general correctness of the results obtained with actual cases indicates that this method should be tried in view of the simplicity of the technique. Any medical man with sufficient skill to add blood aseptically to a slope and possessed of a 37° C. incubator can grow the meningococcus; the putting up of dilutions of varying strength and the need of a 55° C. incubator are dispensed with.

The opinions expressed in the Medical Research Committee's recent pamphlet "The Specific Treatment of Cerebrospinal Fever, with an Analysis of the Reports on the first Ninety Cases treated with Monotypical Sera" emphasize the necessity of early typing and the use of monovalent sera. "Although the aggregate of cases is not large, a considerable proportion of them were severe—some very severe—and the positive evidence which they afford of the therapeutic value of monotypical serum is, therefore, of considerable weight" (M. H. Gordon).

Final deduction from the same pamphlet: "The great importance of promptly determining the type of meningococcus and of using the appropriate serum at the earliest moment" (T. G. M. Hine).

A titre of 1 : 2,000 is desirable to start with.

It is necessary to get rid of the group agglutinins which are always present with sera of this strength. These group agglutinins are eliminated by saturating them with cocci of the heterologous types.

Technique.

One hundred thousand million cocci of each heterologous type, killed by heating to 65° C., are added per cubic centimetre of the serum under treatment. Details as follows:—

Grow a large number of plates, wash off in a few cubic centimetres of saline solution. Kill at 65° C., phenolate, centrifuge for two hours, decant the supernatant fluid, add the serum to the solid cocci remaining. Stir up, put in a bottle, shake well, incubate for two hours at 37° C., repeating the shaking three times during this period. Re-spin till the serum is clear, decant and test against a large number of emulsions of homologous and heterologous cocci for catholicity with regard to the former and specificity with regard to the latter. If specificity is not present, repeat the process of saturation.

Original Communications.

AN ATTEMPT TO EXPLAIN THE GREATER PATHOGENICITY OF *PLASMODIUM FALCIPARUM* AS COMPARED WITH OTHER SPECIES.[1]

By C. C. Bass, M.D.

New Orleans.

Of the three common species of malaria plasmodia, *P. vivax*, *P. malariæ* and *P. falciparum*, the latter is far the most pathogenic. This greater pathogenicity is observed and reported wherever malaria prevails throughout the world. The number of deaths caused by infection with *P. vivax* and *P. malariæ* is insignificant as compared with the number produced by *P. falciparum*. In fact, practically all deaths caused by malaria are caused by *P. falciparum* and almost none by the other species. Not only are nearly all deaths caused by it, but it causes almost all of the pernicious clinical types of malaria

One of the explanations offered for this greater pathogenicity is that the organism produces a more harmful or more powerful toxin. This explanation is theoretical entirely. Another explanation offered is the larger number of parasites that are present in the blood of many of the more pernicious and destructive cases. It is undoubtedly true that the number of parasites is very much larger in the blood of the severer cases due to *P. falciparum* than in those due to other species, but I am not familiar with any definite explanation for this fact. The object of the present paper is to bring up for discussion an explanation which has not previously been advanced, so far as I know, and which, though theoretical, is based upon definite facts. It offers to explain the greater pathogenicity, without the necessity of the supposed greater toxicity. In fact, if one should judge by the number of parasites present in the blood, one would be inclined to think that *P. falciparum* is less toxic than the other parasites, if indeed there is any toxin produced by either.

The general impression is that malaria parasites grow and reproduce in the circulating blood. As a matter of fact, however, the asexual parasites found in the circulating blood are most, if not all of them, more or less accidentally or incidentally swept into the blood-stream from the capillaries in those organisms and tissues where much larger numbers are lodged and growing. Growth and reproduction of malaria parasites takes place chiefly if not entirely in the smallest blood-vessels of certain organs and tissues of the body. To a certain extent, it takes place in capillaries of all organs and tissues, but the parasites are usually more numerous in the bone marrow, spleen, brain and liver in the order named.

P. vivax and *P. malariæ* have more or less amœboid activity and are, therefore, more likely to move about and to pass through or be dislodged from the capillaries than *P. falciparum*, which has extremely little amœboid movement. This may be observed by watching large asexual parasites of the different species under the microscope. The amœboid parasites give one the impression that in the event of lodging in front of narrow places in the capillaries, they would change their shape and at least tend to pass through such places very much like the blood cells do. As a parasite gets larger and larger, most of them finally lodge and remain until segmentation takes place.

After segmentation, the much smaller parasites can, of course, be swept out of a capillary in which the larger parasite has been retained. This lodging of the parasites of these two species is no doubt the explanation for the fact that the number of small parasites present, which is large soon after the paroxysm, becomes smaller and smaller as the parasites get older and larger. It is true that occasionally a few of the amœboid parasites, including rosettes, appear from time to time, and sometimes some of the rosettes actually burst while in the circulating blood. It is not at all probable, however, that any of the merozoites produced in the circulating blood succeed in attaching themselves to other erythrocytes and survive.

In falciparum infection, only ring forms of the schizonts are found in the general circulation. As soon as these parasites reach the proper age and size they disappear from the circulation and do not reappear until merozoites are produced, some or many of which may appear.

The size and age at which young *P. falciparum* disappear from the circulation is different in different individuals. It is quite conceivable that the explanation of this may be the probability that there is slight variation in the size of the capillaries of different individuals. We see a greater number of large parasites in the blood of very young children than we do in that of older persons. In fact, almost all of the large falciparum schizonts that we ever see in ordinary blood preparations are from babies under 1 year of age, in whom it is supposed the capillaries are larger and more patulent than they are in older persons.

Most or all of these parasites disappear from the circulating blood by the time they are 10 or 12 hours old. It appears that by the time this age is reached the parasite has attained a size which does not permit it to pass through the places in which they lodge. Only comparatively small falciparum parasites, therefore, can pass through the places in which parasites lodge and through which much larger vivax and malariæ parasites can pass.

If we take cultures of *P. falciparum* in which the parasites are much older and larger than those found in the circulating blood of infected persons, say 36 or 40 hours old, and study them under the microscope, I believe that we can recognize and demonstrate a very striking quality which very probably affects their transportation by the circulating

[1] From the Department of Experimental Medicine, Tulane College of Medicine, New Orleans, La.

blood. If we place a droplet of culture containing such parasites on a microscope slide, cover it with a cover glass and observe the parasites under the microscope while making pressure on the cover glass with a very delicate instrument, we observe a very remarkable and impressive condition. It is noticed that when pressure is made on the cover glass the erythrocytes present which do not contain any parasites flow back and forth with the current as the pressure is increased or decreased. On the other hand, erythrocytes containing the large parasites remain fixed between the cover glass and slide and do not move with the current. At once one gets the impression that the substance of the parasites is much more resistant to pressure than that of the blood cells. Not only is the consistency much firmer, but the parasite is so large and thick that it holds the cover glass off of the thinner blood cells.

In fact, if one makes and stains preparations of large falciparum schizonts, many of the parasites appear to be much thicker than the erythrocytes which contain them. The impression is very similar to that produced by the nuclei of nucleated erythrocytes, in which case sometimes the nucleus is not in sharp focus when the sharpest focus is on the erythrocyte.

The other species of parasites, on the other hand, do not show this apparent firmer consistency. It is very reasonable, therefore, to assume that the greater pathogenicity of *P. falciparum* results largely from the condition just explained which favours the production of very much larger numbers of parasites, as is known to occur in the pernicious cases. It is not probable that the few merozoites produced in the circulating blood by either species succeed in getting into other cells. They are probably all destroyed in the circulation. It is only those parasites that are produced in the capillaries and succeed in attaching themselves to other cells before they are swept out that survive and reproduce. They probably are the chief source of the clinical symptoms in malaria.

In the few instances in which autopsies have been made in cases where *P. vivax* or *P. malariæ* were either the cause of death or at least were found present, the number of parasites found in the tissues is extremely small compared with the number of parasites found in autopsies where death was caused by *P. falciparum*. In such instances, frequently the tissues are so packed with malaria parasites as to add some colour, produced by the pigment present, in the parasites, as well as that retained in the tissues after the parasites have been destroyed.

One of the most striking pictures of the manner in which disease is produced by specific parasites is that seen in sections or smears from the brain and other organs of patients dying of estivo-autumnal malaria. In the capillaries of the brain most of them may be so obstructed with parasites that no blood could possibly pass through them. Anæmia of the brain results from so many capillaries being obstructed, producing coma, as anæmia of the brain produced in any other way does. It may be of interest to note in this connection that coma is one of the most prominent symptoms in a very large per cent. of all cases of malaria resulting in death. Pernicious symptoms referable to other organs are quite likely produced in a similar manner.

If the lodgment of parasites in the capillaries is largely responsible for the pernicious symptoms, the question may arise as to why the gametes do not also lodge in the capillaries in the same way. Perhaps there is a tendency for them to lodge, and in fact it is quite possible that only certain individuals possess such blood-vessels as are necessary to be most favourable for the exit of gametes. The gametes are amœboid parasites, and in the instance of *P. falciparum* their shape is such as to favour their passage through narrow spaces. In fact, there is some doubt as to whether the crescent has any amœboid ability whatever. Shape and size may be the favourable influences upon which its ability to pass through the capillaries depends.

In conclusion, the theoretical explanation offered for the greater pathogenicity of *P. falciparum* is that the shape of the parasite and unyielding consistency of the substance of which it is composed results in parasites lodging in capillaries to greater extent and there multiplying in larger numbers, more of which survive, than occurs in the other species. The amœboid activity is greater and the cytoplasm is less resistant to pressure in the other species, which is unfavourable to their lodging in capillaries, causing more of the segmentation to take place in the circulation where the merozoites produced are promptly destroyed. This theoretical explanation is based largely upon the observation that artificially cultivated falciparum parasites are more resistant to pressure, that they have little or no amœboid motion in contrast with the other species and upon the finding at autopsy of much larger numbers of capillaries obstructed by falciparum parasites.

LEPROSY AT RODRIGUES.

By E. Mangenie,

Government Medical Officer, Rodrigues.

From information gathered from the oldest inhabitants and from personal investigation there is not the slightest doubt that leprosy was introduced in this island by a man known as "Diango," who came from Mauritius about 40 or 50 years ago.

This "Diango," who evidently married a native of Rodrigues, was employed as a fisherman by a certain family residing at Oyster Bay, a small coast settlement. Four or five years afterwards he developed leprosy; owing to his condition he left Oyster Bay, and went to reside up the mountain about four miles from Oyster Bay.

A year or so after his departure, one of the sons of his employer, who used to fish with him in the same boat, became affected with the disease and from this one and only source of contagion the disease gradually made its apperance in other families all residents of

Oyster Bay. Actually, as far as I am aware there are twenty-three cases of leprosy, sixteen of which are the "direct or through marriage" descendants of the first family affected with the disease and who at one time or other were residents of Oyster Bay. The other seven cases are scattered over the island and these sufferers are the descendants of "Diango."

During the last seven years about five deaths due to leprosy have been registered and about nine new cases of leprosy have come to light, namely five in Oyster Bay, two in Port Mathurin and two at La Ferme.

As the disease tends to run in certain families with a leprous taint, there is some evidence that families coming from a leprous stock are more predisposed to the disease; especially when residing in the same locality, living in close contact with the sufferer, i.e., sleeping, wearing the same clothes, together with the poor diet and bad hygienic surroundings; coupled with these, marriages taking place between near relatives and between leprous and non-leprous families residing in the same neighbourhood—facts which are of daily occurrence in this island—must necessarily play a great part towards the spreading of the disease.

Leprosy being a germ disease and contagion being a primary factor towards the spread of leprosy; while here lepers are allowed to wander where they like, even I am told washing their clothes in the rivers, I would suggest that a scheme for proper and strict isolation should be put in force by Government.

A Case of Multiple Echinococcus Cyst (H. M. Jones, *The Military Surgeon*, August, 1920).—An American soldier of Italian birth, aged 24, had a fall on September 10, 1918, striking his abdomen, after which pain in the hepatic region developed. Shortly afterwards a diagnosis of "hypertrophy of the liver" was made. Multiple abscesses of the liver developed and were operated upon. They had developed from multiple echinococcus cysts which had become infected and had ruptured into the hepatic duct, causing obstruction by cyst membranes. The patient died from sepsis, and autopsy revealed also echinococcus cyst of the spleen, and a right empyema from rupture of the hepatic abscess through the diaphragm. Many leucocyte counts showed no eosinophilia.

Latent Infection in Experimental Spirochætosis (J. L. Todd. *Proc. of Soc. for Exper. Biol. and Med.*, 1920, vol. xvii, pp. 83-84).—Studied the immunity of white rats to *Spirochæta recurrentis*. By inoculation of 1·5 to 2 c.c. of blood aspirated from the heart of the rat under chloroform, spirochætes were proved to be present in an apparently immune rat thirty-two days after the parasites were last seen by the daily examination of blood films. Previous and subsequent inoculations showed this rat to be immune to the strain employed in the experiment. Several similar experiments, however, failed to reveal latent infection in immune rats.

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OCTOBER 1, 1920.

THE EXTRA-PHARMACOPŒIA OF MARTINDALE AND WESTCOTT.

THE first Volume of the Seventeenth Edition of the Extra-Pharmacopœia by W. Harrison Martindale, Ph.D., Ph.Ch., F.C.S., and W. Wynn Westcott, M.B.Lond., D.P.H., has just been published. The book is welcome to the whole profession and has been

waited for impatiently for some time. The Extra-Pharmacopœia is a necessity to every practitioner at home and abroad. The tropical practitioner will find it indispensable and that his branch of medicine is comprehensively dealt with. How does the medical man acquire a knowledge of drugs, prescriptions, writing and combinations? Not from the British or any other pharmacopœia, nor from our several books on materia medica, for they are but the alphabet of this great department of medicine. It would seem to be mostly acquired by watching others—our clinical teachers in the hospital at which we are trained. But they mostly prescribe according to the pharmacopœia of the hospital to which they are attached, and they dictate such stock formulæ by initial letters only, such as M.R.C.P., or F.A.C., meaning Mistura Rhei cum Potassæ and Ferri et Ammonia Citratis, and many a House Physician or House Surgeon goes into practice with these widely used compounds to hand, but unable to write out the prescriptions in full, and but ill equipped to write few others. The consequence is he falls back upon tablets, tabloids, and such like "simples." Where is he to turn for help? He will find more guidance in Martindale's Extra-Pharmacopœia than in any other in our armamentarium. He will find there no mere dogmatic information, but an education in the choice of drugs and a scientific account of their origin, history, and physiological uses, given in a useful and practical setting. It was the former Mr. Martindale we have to thank for the conception and initiation of this great work. His was a mind with special endowment, earnest and enthusiastic in the task he had undertaken, a task requiring an exact knowledge, a scientific mind of the first order, an intimate acquaintance with pharmacy, materia medica and the therapeutic and clinical value of drugs. Such men are rare; whilst Martindale lived he had few, if any equals, and no superior. The present Extra-Pharmacopœia is an inheritance of national importance and the spirit in which it first saw the light is being ably carried on by the present authors. It is impossible to even scan the many additions brought forward in the present volume, the 17th edition. In every department of medicine there have been advances since the last edition appeared. The war has not checked these, in fact several points of importance have been added to our knowledge owing to the existence of a state of war, and in no section of the vast subject has more activity been shown than in that of tropical medicine. To mention some of the newer substances brought prominently before us as antiseptics owing to their use in war we have (*a*) such a substance as *Eusol*, a name given to a solution made by interaction between chlorinated lime and hypochlorous acid and boric acid: (*b*) Dakin's hypochlorite solutions, and (*c*) Milton's disinfectant, another hypochlorite. These are claimed to be deodorizers, or preservative, or insecticide, or all combined, and that they are harmless to the human system. These are examples of modern preparations for wound dressings, &c., but there are many others, such as the chloramine preparations, of equal significance.

During the past few years antimony has come into its own again. Some fifty years ago this drug was in frequent use and a doctor who failed to introduce antimony into a prescription for bronchitis, pneumonia and almost any lung trouble was looked at askance and came within the range of being guilty of malpraxis. Then for some reason the "fashion" died out, for drugs vary in their therapeutic history as fashions in dress and other things do. Recently as a parasiticide in several tropical ailments antimony has engaged supreme attention. In trypanosomiasis, espundia, granuloma inguinale, kala-azar, oriental sore, and also in yaws and relapsing fever, tartar-emetic has been tried and is found efficacious in some of these ailments and promises good results in all. It has even been tried in malaria but the effects did not justify its continuance. The account given of the uses of antimony in the Extra-Pharmacopœia is set forth in lucid and ample style, and not content with the mere exposition of the matter to hand, Dr. Martindale has himself added to our antimony armamentarium by introducing an "injectio antimonii oxidi," and an "injectio antimonii oxidi fortior" for several of these protozoal infections. An "injectio antimonii cinnamica" is also to hand for injections into the mass of carcinomatous tumours. Antimonii oxidi for hypodermic injections is now being extensively used, and gives promise of a useful future. We have long known of James's powder, which contains as much as 33⅓ per cent. of antimonious oxide, and the Italians we know use a Pil. antimonii oxidi et quininæ in malaria, but in almost all febrile states antimony in all its phases is dealt with; now it is lauded for its virtues, now warned against for the physiological disturbances it tends to engender. Its uses still radiate round anæmic and rheumatic affections with a fairly prominent place in the treatment of malaria, a place which is gradually becoming greater day by day. The "quinine alone" treatment of malaria is passing; the one drug, one disease (what the writer has styled the "dock and nettle" system of medicine giving) in vogue for the past 20 years and more is passing, and combinations of drugs—that is wise and scientific therapy—is again asserting itself. The treatment of malaria by quinine alone in enormous doses dies however but slowly; yet we now find arsenic, opium and mercury being added, as they were until about the seventies of last century when the practice of medicine was upset by the introduction of the tabloid and tablet vehicle of treatment. Our old English powder for the ague contained all of these four drugs, and only coincidently perhaps did malaria practically disappear from our land. The writer has used this form of treating all recurring malaria fevers for some twenty years with the greatest benefit; in fact the writer's pill of quinine, arsenic, opium and calomel was given in the Extra-Pharmacopœia of 1915, but it has been "crowded out" of the present edition. A deservedly prominent place is given in the present volume to organic arsenic compounds. In two series the aliphatic (or cacodylate) and the aromatic are discussed in many pages of text, not a bit too ample for the growing work being done in the world of therapy. The great scheme of colloidal metals, their

constitution and their therapeutic value is handled in a masterly fashion by the authors of the Extra-Pharmacopœia; the intricacy of the production of these substances and the part they play as drugs in the treatment of disease is still being tested by practitioners. The unfamiliar essence of their existence is bewildering by its newness, and resembles nothing that has gone before. To handle such a mode of treatment scientifically requires a close study of their vito-chemical behaviour, for they seem on the border-land of things organic and inorganic. A great future lies before these wonderful productions, but time will prove their value, and they promise to outstrip all known elements in their therapeutic powers. A careful study of colloids as they are set forth by the authors will well repay interested readers, for no better exposition of their practical application and usefulness has ever been given us.

We have not left space to deal with even the great subject of Quinine, and many others which form the A. B. C. of our drugs in daily use, and we cannot find a niche in this preliminary notice of the encyclopædia of "things practical and scientific" in the world of drugs and their uses. Vaccines and their anti-toxins, organo-therapy, and the Therapeutic Index of Diseases and Symptoms, &c., &c., &c., occupy a large part of this *magnum opus* and must be reviewed separately and individually.

We thank the writers for their pains and the arduous work they have undertaken on our behalf, and we congratulate them on the success of their labours. We believe a book of this nature is unique in medical literature, and we feel proud to think that we have men amongst us with the patriotism and the ability to raise the prestige of British research, therapeutics and pharmacology upon so high a pinnacle.

Annotations.

Spirochæta recurrentis: A Filter Passer. J. L. Todd (*Jour. of Parasitology*, March, 1920, vol. vi, pp. 152-154) has shown that *Spirochæta recurrentis* can be forced in its type form through a "W" Berkefeld filter, and that all infective forms of this organism are not thrown down by centrifugalization at varying speeds and for varying times.

Penetration of the Intestine by Endamœba Histolytica (Kenneth M. Lynch, M.D., *Journal of the American Medical Association*, vol. lxxv, No. 1, July 3, 1920).—The author gives observations made by him in post-mortem work regarding the manner in which the amœba gains entrance to the tissues of the wall of the intestine, a point which is not yet decided. The author did not meet with any evidence that the amœba passes through the surface of the mucosa, but noted that there was an invasion into the glands; groups of three or four or more amœbæ being found in the bottom of crypts in which the epithelium had been wholly or partly destroyed. From this nest the amœbæ migrate through the basement of the gland and through the intervening tissues and muscularis into the submucosa. The entrance once established there occurs a migration in all directions except towards the lumen of the intestine. A thrombosis of submucosa or muscularis occurs, and a necrosis of the tissue above, and the development of the ulcer leading to the surface.

Remarks on some cases of Paratyphoid B (I. Jacono, Studium, *Rivista di Scienza Medica*, June 20, 1920).—In this interesting paper the author describes ten cases of paratyphoid B. In several the temperature was of an intermittent type during the whole course of the malady, and in these the hæmocultures carried out using Castellani's dilution method were negative with blood collected during the afebrile hours, while they were constantly positive when the blood was collected during the acme of the daily febrile attack. In all cases of whatever type, it was found that towards the end of the malady when the agglutination was very high, the percentage of positive blood-culture decreased rapidly.

A Case of Hereditary Diabetes (F. M. Allen, M.D., and J. W. Mitchell, M.D., *Archives of Internal Medicine*, vol. xxv, No. 6, June 15, 19 0).—Allen and Mitchell record the case of a soldier suffering from diabetes who came of a family in which seven out of fourteen children of one father (one by one woman, thirteen by another) were diabetic. In addition to treatment, clinical and pathological investigations were undertaken to throw light on the hereditary feature of the condition. The patient when received was in the later stages of diabetes and tuberculosis, with dangerous acidosis, emaciation and weakness. In consequence of a week of fasting and a month of extreme undernutrition, he became able to tolerate diets between 1,500 and 2,000 calories without glycosuria or acidosis, showed improvement in strength and lung symptoms, and lived six months. This result in a case of this severity adds to the evidence that the combination of diabetes and tuberculosis is best treated by a diet which controls diabetes.

Clinical examination of the patient and his family for general or focal infections were negative. The Wassermann reaction was negative. Glucose tolerance tests afforded an early diagnosis of one of the above-mentioned seven cases of diabetes but were negative in the mother and remaining children. The gross and microscopic pathological findings excluded syphilis, being characteristic of tuberculosis. The pancreas showed occasional hydropic degeneration, the result of functional over-strain, and slight fibrosis and hyaline formation in islands, indicative of infections or toxic damage as the cause of the diabetes.

In general the diabetic heredity came through the father and occurred in the children which most resembled him. From the glucose tolerance tests the diabetic tendency was inherited as a unit character, the tolerance of the remaining children being normal. This case conforms to the general rule that signs of infectious or toxic damage are found similarly in heredity and other cases of diabetes. The reason for the peculiar liability to diabetogenic injuries in certain families is undetermined.

Ocular Symptoms in Encephalitis Lethargica (E. B. Spaeth, *The Military Surgeon*, Aug., 1920.)—The ocular symptoms presented in five cases of encephalitis lethargica of varying severity which all recovered included varying combinations of dilated and unequal pupils, sluggish reaction to light and accommodation, disturbed muscle balance with diplopia, whilst one case showed mild bilateral optic neuritis, and one case showed bilateral lagopthalmos with diminished corneal sensitiveness and commencing corneal ulceration. The principal forms and treatment included hydro-therapy, electro-therapy, prism and other muscle exercises, atropine and heat.

Prevention of Simple Goitre in Man (D. Marine and O. P. Kimball, *Archives of Internal Medicine*, vol. xxv, No. 6, June 15, 1920).—From thirty months observations on the prevention of simple goitre in man Marine and Kimball found that the disease is as readily prevented as in fish and domestic animals. Of 2,190 pupils in a girls' school taking 2 grm. sodium iodide twice yearly, five have shown enlargement of the thyroid, while of 2,305 pupils not taking the prophylactic 495 have shown enlargement. Of 1,182 pupils with thyroid enlargement at the first examination and who took the prophylactic, 773 thyroids have decreased in size, while of 1,048 pupils with thyroid enlargement at the first examination who did not take the prophylactic 145 thyroids have decreased in size. These figures strikingly demonstrate both the preventive and the therapeutic effects of sodium iodide.

Some experiments bearing upon the Intravenous Vaccine Treatment of Typhoid Fever. (Oscar Teague, M.D., *Proceedings of the Medical Association of the Isthmian Canal Zone*).—The results obtained in 1914 by Ichikawa in Japan and independently by Prof. Rudolph Kraus in the Argentine Republic, in the treatment of typhoid fever by the intravenous administration of vaccine, effecting a cure by crisis, has created a strong revival of interest in this method of treating typhoid. During the war it was tried in the German Army Hospitals with satisfactory results, the course of the disease in successful cases being shortened by from one to three weeks. The treatment causes a violent reaction consisting in a severe chill beginning in about half-an-hour after the injection is given (dose 100,000,000 to 750,000,000 bacilli) and a rise of temperature to 105° or 106° or more. In from 24 to 48 hours the temperature drops to normal and the general condition of the patient shows a most remarkable improvement. In the unsuccessful cases the reaction occurred but the temperature again rose and the disease proceeded as though the vaccine had not been administered.

The present paper is an investigation into the cause or process of the cure by crisis. As the whole reaction is accomplished within 48 hours the process cannot be an immunization against typhoid, for immunization antibodies only begin to appear on the third or fourth day. The reaction is not specific. Kraus has shown that not only injections of typhoid vaccine, but injections of *Bacillus coli* vaccine and cholera vaccine cause the reaction to occur in typhoid patients. Teague and his assistants made leucocyte counts and smears of the blood of two typhoid cases for differential counts every hour for 34 hours following the injection. The white cell counts dropped to 1,500 at the third hour in one instance and to 2,500 in one-and-half hours in the other. The counts then rapidly rose to a little over 20,000 in both cases. The counts then dropped, reaching their original level in 48 and 36 hours respectively. Teague then made various animal experiments of which he gives the results. He investigates the various hypotheses which have been advanced to account for the cure by crisis; he concludes that none of these offer an adequate explanation of the phenomenon. Believing that typhoid fever is a local disease and not a septicæmia, Teague's solution is that the hacteria multiply, not in the blood, which has been shown to contain bacteriolytic substances, but in certain tissues, the tissue fluid or lymph of which is not bacteriolytic. The intravenous injection of vaccine may be the cause of a more active passage of bacteriolytic substances from the blood capillaries into the lymph, thus causing a destruction of the typhoid bacilli and healing of the local lesions. This explanation would also account, Teague thinks, for other instances of so-called non-specific vaccine therapy; the bacteria antibodies in each instance heing probably transferred from the blood where they are present in excess, to the fluids of the diseased tissues where they are urgently needed.

Abstracts.

THE *ASCARIS LUMBRICOIDES* AS THE CAUSE OF URGENT SYMPTOMS IN DISEASE AMONGST CHILDREN.[1]

By Charles Pentland, M.D., M.Ch., B.A., J.P.

In my practice amongst children during the past six months, I have been very much struck by the number of cases of severe acute forms of sickness directly attributable to worms, and practically almost in every case to the *Ascaris lumbricoides*. The embryo, as we are aware, forms in each ovum after its discharge in the stools, and then re-enters the body, by means, it is supposed, of drinking water, vegetables, or impure starchy material; hut the endeavour to trace the exact cause of the appearance of worms in so many children is found somewhat difficult. In most of the cases which came under my notice, the source of the water was from "spring wells," samples of which I have had analysed. These were reported pure and free from traces of ova of the ascaris.

Contrary to what one would expect, all the children before heing attacked were of an unusually

[1] Abstracted from the *Practitioner*, No. 622, vol. civ., No. 4, April, 1920.

healthy and vigorous type; one is accustomed to associate worms chiefly with strumous and delicate children. An acute attack of worms presents, from a diagnostic point of view, symptoms which are by no means characteristic. I have found that severe pain referred to the umbilical region has been the most constant symptom, associated with a high temperature ranging from 105° to 103° F. Closely simulating an attack of peritonitis or appendicitis in its early stage, the tenderness apparent in some of the cases has been very pronounced and most acute; other local symptoms have been uneasiness, attacks of severe colic, vomiting and faintness, capricious appetite, and irregularity of the bowels, constipation and diarrhœa alternating. When one is confronted on a first visit with the following type of case, it is extremely difficult to form a diagnosis:—

Child, aged 5 years.—Tongue heavily coated, of a putty-like appearance, great malaise, complaining of severe pain and tenderness in region of umbilicus, cough, and temperature 104° F., with constipation, but no history of having passed worms according to the knowledge of the child's mother.

I have had three such typical cases during the past month, A, B, and C.:—

In each case I prescribed a diaphoretic mixture, and santonin and hydrarg. c. cret., with the result that, on the first evacuation of the bowels in Case A, five round worms, measuring from 4 to 6 inches, were expelled; in Case B, twelve worms were expelled, measuring from 2 to 4 inches; in Case C, one large worm measuring about 5 inches was vomited, and five small ones were expelled per rectum. In Case A, the temperature, which was 104° F., came down to normal on the second day. In Case B, the temperature, which was 105° F., was normal on the fourth day, and in Case C, the temperature, which was never above 102° F., came to normal on fifth day. No further symptoms were manifested, and the children appeared in normal health, quite lively, and anxious for food, though subsequently these cases showed a fair amount of anæmia which has practically disappeared with the administration of the usual tonics.

Another case equally remarkable and equally difficult of explanation occurred in my practice some months ago:—

Child, aged 9 years.—Temperature 102° F., tongue roughly coated, great thirst and a distinct degree of jaundice present, much tenderness over right hypogastrium, with vomiting and delirium. This case, however, had a history of having frequently passed worms a month previous to my seeing her. After the usual examination and excluding urgent diseases, I prescribed santonin powders combined with hydrarg. subchlor.; in two days afterwards a large round worm was evacuated. I continued the calomel in 1-gr. doses for six days; the jaundice rapidly cleared up; three small worms were passed. About the twelfth day the patient returned to health quite normally, all symptoms of jaundice having disappeared.

Here, I am of opinion that the worm must have been lodged in the common bile duct, causing temporary jaundice. These cases may be of interest in so far as the symptoms appeared to be so unusual of worms, and resembling more the forms of acute disease. In many forms of sickness, no matter how rare, amongst children it is advisable not to overlook worms as a probable cause of the urgent and distressing symptoms which one so often meets with.

BETANAPHTHOL POISONING IN THE TREATMENT OF HOOKWORM DISEASE.[1]

By Wilson G. Smillie, M.D.

In recent years it has been discovered that betanaphthol is useful in the treatment of hookworm disease; The dose of 0·2 to 0·5 grm., usually recommended for internal medication, has been regarded as only slightly toxic to the patient. Thymol and oil of chenopodium, the other two drugs commonly employed in the treatment of hookworm disease, have always been considered more effective than betanaphthol, but the dosage generally recommended produces toxic symptoms that are both more frequent and more severe than those caused by betanaphthol. Theoretically betanaphthol should be a valuable addition to the anthelmintic armamentarium, if it can be proved efficacious and non-toxic.

The report of Gonzaga and Lima is most encouraging. It states, in brief, that betanaphthol, in the heavy dosage which they used was practically non-toxic, and was almost as efficacious as thymol, much more so than oil of chenopodium. From among 400 heavily infected cases treated by this method 73·5 per cent. of cures were effected, and no severe toxic symptoms were encountered.

Field Experiments with Large Doses of Betanaphthol.

In view of these increasing developments from betanaphthol treatments, and in order to test the efficacy and toxicity of large doses of this drug in the treatment of hookworm disease, a series of four experiments involving, in all, seventy-nine cases, was undertaken.

Experiment 1, carried on among a representative group of twenty-nine labourers (nineteen adults and ten children) on a coffee fazenda near Ribeirao Proto-Sao Paulo, Brazil, included nearly equal numbers of males and females. The children were between 6 and 14 years of age. The average hæmoglobin of the group was 63·2 per cent. There were no cases of malaria on this fazenda, no palpable spleens among the group, none of the patients had had intermittent fever in at least ten years, and there was no record of malaria having been in the valley for many years. Gonzaga and Lima's field treatment dosage was adopted. For persons from 20 to 50 years old one dose of 6 grm. of Mallinckrodt's sublimated betanaphthol was given on

[1] Abstracted from the *Journal of the American Medical Association, Vol.* 74, *No.* 22, *May* 29, 1920.

three successive mornings (with a graduated dose for children), in hard gelatin capsules with a little water. The final dose was followed after two hours by a saline purge. Symptoms produced by treatment were mild and transient; practically no vomiting occurred. A fresh specimen of urine was obtained every morning from each patient; no highly coloured, bloody or smoky urine was found. The conclusion from experiment 1 was that betanaphthol in 18-grm. doses is only slightly toxic.

Experiment 2 was carried out to obtain a larger series of cases. Nineteen adults and eleven children—Brazilian mulattoes and negroes—on another fazenda were selected. There had been a few cases of malaria on this fazenda in two years, and the group included two cases of severe anæmia. The average hæmoglobin was 69 per cent. The drug, dose, and method of administration were all the same as in Experiment 1. Except for one case (Case 1), which will be discussed in detail later, no symptoms appeared as a result of treatment. Most of the patients worked in the harvest fields throughout their three days of medication.

In Experiment 3 there were ten men suffering from trachoma or other chronic eye disease, all of them field labourers from coffee fazendas in the interior of the state of Sao Paulo. The races chiefly represented were Italian and Brazilian. Sixty-seven per cent. was the average hæmoglobin of the group, some members of which had suffered previously from malaria. The same method of treatment and the same dosage of betanaphthol were adopted as in the preceding experiments, but the drug was a Parke, Davis and Co. preparation, already mixed with charcoal, and put up in 0·5-grm. doses in gelatin capsules. Symptoms following treatment were extremely slight and transient. One characteristic was common to all ten cases —increase in the transitional cells. One man (Case 2, to be discussed later) suffered marked destruction of red blood cells, as revealed by blood and urine examinations.

Experiment 4 had as its chief object a careful study of the urine pigment which, Experiment 3 had shown, sometimes turned brown or black on standing. A new group of ten men received exactly the same treatment as that given in Experiment 3. Mallinckrodt's sublimated betanaphthol was used, as in experiments 1 and 2. The symptoms following treatment, as in Experiment 3, were negligible, except in the case of one man (Case 4), whose history will be discussed later.

Conclusions.

The four experiments prove that betanaphthol in 6-grm. doses, given on three successive days, may produce a severe toxic effect similar to that caused by benzol (benzene, C_6H_6), in that it specifically attacks the red blood cells. In the four cases of betanaphthol poisoning reported, while the symptomatology varied greatly, the essential pathology common to all cases was simply a destruction of red blood cells with perhaps in the severe cases a destruction of the blood-forming cells in the bone marrow. It is hard to explain how the betanaphthol destroys the red blood cells, and why seventy-five of the cases which I treated showed no symptoms, while four became victims of the drug's toxic action. Comparison of the cases and of their history previous to the betanaphthol treatment would certainly seem to indicate, first, that the intoxication shown by the poisoned cases was not due to their greater intestinal absorption of the drug; second, that the size of the dose was not proportionate to the degree of intoxication, and third, that the degree of previous anæmia in the patient had apparently nothing to do with the toxic effect of the drug. The experiments also showed that the drug had little or no effect on normal kidneys. In certain cases, to be sure, there was much albumin in the urine, with many casts; but this condition was due to the elimination of the waste products from the blood.

Finally, the following definite conclusions concerning the toxic action of betanaphthol were arrived at as a result of the experiments that have been described.

1. Large doses of betanaphthol (18 grm. for adults) used in the treatment of seventy-nine cases of hookworm disease produced very severe toxic symptoms in two cases, and also produced marked changes in the blood cells of two other cases.

2. The toxic action of betanaphthol in these four cases was a destruction of the red blood cells. The drug selected the red blood cells and destroyed them in great numbers, with resultant severe anæmia, icterus, enlargement of the spleen and liver, enlargement of the gall bladder and hæmoglobinuria. The white blood cells were apparently not destroyed by the drug. The liver, spleen, kidneys and other organs of the body were not affected primarily, but were markedly affected secondarily, because of the anæmia, and because of the injurious effects produced by the elimination of large numbers of destroyed red blood cells.

3. The type of cases that are most susceptible to the toxic action of betanaphthol poisoning has not been determined. In all three of the severe cases of poisoning there was a history of recent malaria. It is probable that those cases in which the red blood cells are rendered more fragile by recent malaria are more susceptible to betanaphthol poisoning.

4. Betanaphthol, in 18-grm. doses, is so toxic that it cannot be recommended for general use in the treatment of hookworm disease.

LETHARGIC ENCEPHALITIS. HISTORY, PATHOLOGIC AND CLINICAL FEATURES, AND EPIDEMIOLOGY IN BRIEF.[1]

By Simon Flexner, M.D.

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Historical.

With this introduction I shall now consider certain historical points regarding lethargic encephalitis. It appears that the first cases of that disease recognized in the United States occurred in

[1] Abstracted from the *Journ. Amer. Med. Assoc.*, vol. lxxiv, No. 13, March 27, 1920, p. 865.

the winter of 1918-1919. In contradistinction to epidemic poliomyelitis, there is no reason to suppose that this epidemic affection of the central nervous system ever before existed in America. This point is an important one. At present the disease seems to be widely distributed, as cases have been reported from many States.

It is possible to trace the cases of lethargic or epidemic encephalitis now arising in this country to an outbreak which occurred in Vienna and neighbouring parts of Austria in the winter of 1916. Because of war conditions, knowledge of this unusual disease did not at once reach Western Europe and the United States; but nevertheless cases of the disease occurred in England and France in the early months of 1918, and in America about one year later.

Both in Austria and in England, in which countries the first cases were observed respectively in Eastern and Western Europe, the disease was first mistakenly attributed to food intoxications. In Austria the early cases were ascribed to sausage poisoning, in England to botulism arising from various foods.

This error is not perhaps as remarkable as might at first sight appear. In the first place, both countries were labouring under unprecedented conditions of food shortage, Austria because of the blockade, England because of the submarine. Moreover, because of this shortage preserved foods were employed on a scale never before equalled, and, of course, waste and refuse were reduced to a minimum. Furthermore, an early symptom of this encephalitis is third nerve paralysis—giving rise to diplopia, ptosis, &c.—which happens also to be an early symptom in certain forms of food poisoning, and notably in botulism.

Ultimately, in both countries the notion of food origin became untenable, and the disease was recognized as arising independently of diet and other usual conditions of life, and came to be viewed as probably of microbic origin and of communicable nature.

Pathologic.

The first fatal cases, which occurred in Vienna, supplied on historic study a physical basis for the symptoms observed during life; and the first English and French cases similarly examined microscopically showed lesions identical with those described for the Austrian cases. In due time the anatomic study of cases arising in the United States and still other countries showed close agreement with the others, and now a histologic basis of the pathology of the disease, of remarkable concordance, has been provided. On this basis we may now regard lethargic encephalitis as representing a definite pathologic as well as clinical complex, and to consider it as a distinct disease.

The histologic changes or lesions of lethargic encephalitis may be both extensive and profound. Those so far described as confined to the central nervous system affect particularly the brain and especially the gray matter at the base of that organ. While, indeed, any part of the gray matter may be involved, the lesions are found in the cortex and in the cerebellum, the structures particularly affected are those about the third ventricle, the aqueduct of Sylvius, the lateral ventricle and optic thalamus, and the pons and medulla. The spinal cord is variably involved. In general, it may be stated that the severity of the cerebral lesions diminishes from before backward; the upper or cervical cord often shows changes; but it is still to be determined how often and to what extent the cord as a whole is affected.

The lesions themselves consist of cellular aggregations about the blood-vessels, cellular infiltrations in the nerve tissue themselves, small, often microscopic hæmorrhages, and an outpouring of plasma or lymph into the tissue interstices (œdema). The cellular accumulations and invasions are chiefly mononuclear in nature (lymphocytes, plasma cells, polyblasts); polymorphonuclear cells are also encountered, but are relatively inconspicuous. The lesions themselves occur in nodular and in diffuse forms; and those of the tissues are at times clearly associated with the vascular affections, and at other times are so extensive as not to be brought into relation with particular vascular involvements. The paralysis of the ocular, facial and other muscles which sometimes occur arise, with rare exceptions, from the cellular and other invasions of the nuclei of the corresponding nerves.

Clinical.

The clinical phenomena or symptoms of lethargic encephalitis are referable to the lesions of the central nervous organs or the pathologic process, as sketched. It is perhaps too early in the study of the disease to set up hard-and-fast clinical varieties or types. However, attempts at classification have already been made. One of the most comprehensive is that of MacNalty, which is reproduced here, as it is suggestive and may prove useful in practice. MacNalty distinguishes six groups of cases: (1) Cases with general symptoms and without localizing signs; (2) cases with third nerve paralysis and general disturbance in the function of the central nervous system; (3) cases with facial paralysis and general disturbance in the function of the central nervous system; (4) cases with spinal manifestations and general disturbance in the function of the central nervous system; (5) cases with polyneuritic manifestations and general disturbance in the functions of the central nervous system; and (6) cases with mild or transient manifestations (so-called "abortive" cases). To these should be added cases of paralysis of other motor cranial nerves than the third and fifth, such as those of deglutition and respiration.

Probably there is an incubation and prodromal period which precedes the onset of the striking subjective and objective symptoms of the disease; but thus far these have not been defined. Hence

the so-called onset of the disease is usually described as sudden or acute. The latter is, indeed, so striking that the patient is able often to tell the precise hour of a particular day on which he fell ill. Actually the striking symptoms often develop more slowly than in poliomyelitis.

The initial symptoms are described as chills, lassitude and general malaise, headache and general pains, nausea and anorexia, associated often with the common symptoms of upper respiratory catarrhal affections. Fever is an irregular manifestation. It may be present at onset or may appear only later. The temperature range tends not to be high—from 101° to 102° F.—but it sometimes swings to 103° or 104° F. As the symptoms develop there arise lethargy or drowsiness, vertigo, tinnitus, muscular weakness, blurred or misty vision, diplopia, photophobia, tremors and twitchings, ataxia, delirium, irritability, restlessness, mental depression and other alterations, difficulty in articulation and in swallowing, stiffness of neck and spasticity of other muscles, sweating, hiccough, &c. Amongst the earliest symptoms to arrest the attention of the patient and the physician are diplopia and ptosis with varying degrees of lethargy. But still other paralysis (e.g., facial) may appear, and lethargy may arise independently of all localizing nervous signs.

The outstanding features of the disease is the lethargy, which is progressive in character and present in the great majority of cases (80 per cent.?) It may appear suddenly, but usually is gradual in onset. The patient becomes apathetic and dull, appears dazed or stupid, the hours of sleep become prolonged, and he is hard to wake in the morning. Moreover, he may fall asleep at odd hours—while engaged at work or at meal times. The lethargy may deepen into stupor or even into coma. Its duration is variable—a week, a month, or even longer—up to four months. Even after long periods recovery may still follow. During the lethargy there may be lack of facial expression (mask-like features), from which the patient can be aroused by loud speaking, prodding, &c., to partake of food or answer questions. But cases in which marked restlessness and even mania have been present followed by lethargy have been noted.

Symptoms referable to irritations of the meninges appear. Usually they are slight, and while sometimes arousing suspicion of acute meningitis, that condition is excluded by lumbar puncture and examination of the cerebrospinal fluid. The fluid tends to be under somewhat increased pressure, but clear. The number of cells is lightly inercased (very rarely 100 per c.mm.), and the globulin content little and sometimes not at all exeessive. The cells, which range usually around 10 to 20 per c.mm., consist partly of mononuclear and partly of polymorphonuclear leucocytes. In addition, the important point of the rare presence of Kernig's sign should be mentioned.

The occurrence of paralysis of the face muscles has been mentioned. Paralysis of the extremities is rare; wrist drop has been noted in at least one instance. But a far more common symptom is rigidity or spasticity, chiefly of the extremities, which in a few cases has been observed to extend to the spinal and even the facial muscles, making a picture suggestive of paralysis agitans. This spasticity of the extremities is ascribable to involvement in the encephalitic process of the lenticular nucleus and the corpus striatum.

The duration of the stupor is very variable; it may last a few days, for weeks, or even for months, and recovery still take place. The return to clear mentality is usually gradual; muscular power also tends to return slowly, and general convalescence tends to be prolonged. In paralytic examples of the disease, rapid, complete, or partial clearing of the palsies has been noted.

The number of cases of undoubted lethargic encephalitis thus far reported is too small to indicate the age periods of greatest incidence. For the present it may be stated that the disease occurs at all ages—namely, from a few months to advanced years (over 70 years). Likewise, it appears as if the two sexes were about equally attacked.

The fatalities reported range from 20 to 35 or 40 per cent. Probably the higher mortalities refer to groups of the severer cases of the disease. Since knowledge of the disease is still very restricted and diagnosis still in its beginnings, probably many cases of lighter affection are overlooked or given other names and interpretations, thus making it impossible at present to arrive at an accurate estimation of the prognosis and mortality. At best, however, the disease is to be regarded as serious, whether from the point of view of long duration from onset to restoration of health, or of fatality. The chief immediate causes of death reported have been intercurrent pneumonia and paralysis of the respiratory centre in the medulla.

Present indications are that the degree of communicability of lethargic encephalitis or susceptibility to the disease is low, possibly equalling that of epidemic poliomyelitis as observed in ordinary times. The seasonal incidence seems to be mid-winter, in that respect resembling epidemic meningitis and differing widely from epidemic poliomyelitis, which prevails usually in midsummer and early autumn.

Explanations of the lethargic state have been offered. A toxic origin is, of course, possible. It seems more likely, however, in view of the nature and distribution of the lesions, that its source is rather a mechanical one. It is known that the sensory stimuli from the special and other senses pass by way of the thalamus to the cerebral cortex. Since, therefore, the thalamus is so commonly the seat of the cellular infiltrative lesions described, it would appear that the stimuli are interrupted in that organ on the way to the cortex, whence a kind of sleep supervenes. The obstruction to the stimuli is not absolute, since the patient can be aroused by increasing their intensity (as by loud speaking, prodding, &c.).

Epidemiologic.

It is now sufficiently obvious why the popular name of "sleeping sickness" has been applied to this malady. The disease is, of course, wholly distinct from African sleeping sickness, which is a trypanosomal infection carried from person to person by means of an insect vector—the tsetse-fly.

When an apparently new disease arises, it is always important to inquire whether the particular set of symptoms that are taken to characterize it has been observed and recorded before.

In the present instance there are two significant records which may easily refer to a similar and possibly identical disease. The first one dates from 1712, and refers to an outbreak of so-called sleeping sickness centring about Tubingen in Germany. The second record dates from 1890, and deals with a rather puzzling malady called "nona," which is described rather in the lay than the medical literature of the time, and seems to have prevailed in the territory bounded by Austria, Italy and Switzerland. In respect to neither instance, however, do the records contain the minuter data which would admit of a certain identification of the disease described with the encephalitic malady we are considering.

One circumstance is, however, significantly suggestive. The location of the 1890 affection "nona," which was characterized by somnolence, stupor and coma, coincides roughly at least with that of the first cases reported in the present epidemic. The question may, therefore, well be raised whether the endemic home of this epidemic variety of encephalitis may not be that corner of South-eastern Europe overlapping the three countries mentioned. If this should prove to be probable, the next questions to arise would relate to the circumstances under which the disease slumbered on in ordinary times, and to the conditions that favoured a greater activity and a wider spread about the year 1916.

To deal with the first one will require particular and intensive studies carried out with the especial object in view to disclose hidden cases in the region originally affected. An answer can in the meantime be hazarded to the second question. The depressing effects of war, acting by way of hunger, cold, migrations of population, and general insanitation, might initiate the conditions through which a low endemic might well be converted into a higher epidemic incidence of the disease.

In effect, a similar set of depressing and favouring conditions may be supplied by a highly debilitating and destructive epidemic, such as the periodic waves of pandemic influenza which recur from time to time. In this manner may possibly be explained the coincidence of the Tübingen epidemic of 1712, also called sleeping sickness, and of the "nona" of 1890 with epidemic influenza, just as the wider distribution of the encephalitic malady and the influenza epidemics of 1918 and of 1920 may be similarly associated. In other words, what the depressing circumstances of the war did for Austria-Hungary in 1916, the pandemic of influenza may have done for the rest of the world in 1918 and subsequently—namely, prepare the soil, as it were, for the growth in number of cases and for increase in intensity and capacity for spread of an infectious nervous disease ordinarily narrowly localized and moderately benign.

This relationship of lethargic encephalitis to the epidemic of influenza has, indeed, led to a discussion as to whether the former is not merely a sequel early or late—attending a certain, if only small number, of cases of epidemic influenza.

Regarded merely chronologically, the question thus presents itself. In 1916, when the first cases of encephalitis appeared, or at least were recognized in Austria, the epidemic of influenza which prevailed later, in 1918, had not yet been noted. In the instances of England, France, the United States and some other countries, the epidemic influenza and cases of lethargic encephalitis were more or less coincidental. Since influenza varies so much in degree of severity, it is of little moment to debate whether or not victims of the encephalitis had previously suffered from influenza.

On the other hand, there is no recognized numerical relationship between the extent of influenza and the number of cases arising, or at least identified, of the encephalitis. It is, of course, true that encephalitis has long been recognized as one of the sequels of epidemic influenza. Indeed, in the etiology of encephalitis, influenza occupies a prominent place; but in no other pandemic of influenza has this remarkable association of encephalitis occurred with certainty. Little weight can be given the supposed coincidence of influenza and the "sleeping sickness" of 1712; and it is highly improbable that the semi-mysterious affection, "nona," which dates from 1890, should have taken its origin from the influenza epidemic in South-eastern Europe at that period, and the association not have been observed elsewhere in Europe or even in America at the same time as a concomitant of the influenza epidemic, which raged with great intensity in those countries. Moreover, the occasional cases of encephalitis definitely observed to follow attacks of influenza have presented a more hæmorrhagic character, and sometimes have been attended by Pfeiffer bacilli in the nervous tissues and meninges, which is not the case in the lethargic disease we are now considering.

Finally, should the reported experimental transmission of the encephalitis to animals be confirmed, a further distinction from the influenza variety will have been established. Therefore, the outbreak of lethargic encephalitis either ante-dated (Austria) the pandemic of influenza of 1918, or (in other words) the two diseases more or less overlapped, that is, although probably quite by accident, they prevailed concurrently. It is desirable, for the time being at least, to regard them as independent diseases

The history of lethargic encephalitis indicates its

infectious and also its communicable nature, but thus far single rather than multiple cases have been observed in family and other intimate groups of persons. However, two cases in a family have very rarely been noted; and in one instance an institutional outbreak has been reported in which among twenty-one inmates of a girls' home twelve cases arose, with five deaths. Whether more accurate means of diagnosis, through which the non-localizing or "abortive" and the frankly paralytic lethargic cases would be more certainly associated and thus lead to a general revision of present views regarding multiple cases, can only be surmised. Obviously, in the interest of knowledge as well as of the prevention of the disease, close attention to this point is desirable.

It is now a matter of great importance to determine the precise nature or etiology of lethargic encephalitis. Many unsuccessful attempts have been made to communicate the disease to monkeys and other animals through the inoculation of nervous tissues showing the particular lesions, in the manner so readily and successfully employed in monkeys for poliomyelitis. This circumstance would alone serve to distinguish this epidemic encephalitis from epidemic poliomyelitis. But in two or three instances what are stated to be successful transmissions of the disease to animals have been reported.

von Wiesner of Vienna inoculated a monkey subdurally with nervous tissue from a fatal case of von Economo's. This animal quickly became severely sick and died in about forty-eight hours. At necropsy a meningo-encephalitis was found, and from the lesions a diplo-streptococcus was cultivated. While von Wiesner regarded this experiment as successful, further investigation has indicated that the infection with the bacteria was an accidental and secondary process, and the diplo-streptococcus is not etiologically related to lethargic encephalitis.

Loewe, Hirschfeld and Strauss inoculated rabbits and monkeys with filtered extracts of the nasopharynx of cases of the encephalitis, and also with filtered nasopharyngeal washings, and have induced a meningo-encephalitis in those animals. Apparently they did not succeed in infecting those animals by inoculating the affected nerve tissues themselves. They also believe that they have cultivated a minute organism, resembling the globoid bodies of poliomyelitis, which they think may be the inciting microbic agent of the disease. Discrepancies exist between the positive results of these authors and the many failures of others with similar inoculations which only greater experience can clear up

Finally, McIntosh, of the London Hospital, announced that a monkey inoculated with the material from the fatal cases in the home for girls, already referred to, presented lethargic symptoms and tremors and died. The brain on examination is said to have shown lesions similar to those found in human cases of lethargic encephalitis.

Current Literature.

INDIAN MEDICAL GAZETTE, July, 1920.

Notes on certain Cases of Fever (R. B. Seymour Sewell).—Clinical notes on cases of fever of unknown etiology of a few days with headache, pains in the joints, constipation. The author believes that the unknown infective agent of this fever is carried by body-lice.

Human Bites (L. H. Hennessy).—From what appears at first to be a trivial wound a protracted illness may arise, with necrosis of bone. Spirochætes and fusiform bacilli are often found and treatment by novarsenobenzol either locally or by injection is indicated in early cases.

Treatment of Purpura Hæmorrhagica (Pratap Singh Khosla).—The author confirms the usefulness of calcium salts combined with iron. His usual prescription is calcii chlorid. gr. x-xv, tinct. ferri perchl. ♏x, tinct. hyoscyami ♏xxx, aquam ad ℥i—sig. t.d.s.

Treatment of Plague by the Solution of Iodine and Camphor (S. Mallanah).—In the author's experience the combination of iodine and camphor reduces the percentage of mortality more than any other treatment he has tried.

A plea to ligate the Hydrocele Sac with living tissue. (M. L. Bundu).—The author considers that this procedure is very useful in preventing hæmorrhage, sepsis and recurrence.

Flavine in Ophthalmic Practice (P. Ganguli).—The author has found flavine very valuable in ophthalmic practice especially in the treatment of mucopurulent conjunctivitis and ulcerative keratitis caused by Koch-Week's bacillus and pyogenic cocci.

Medical News.

MR. BALFOUR, on behalf of the Council of the League of Nations, has addressed to the various Governments an appeal for £250,000 to combat typhus in Poland.

THE Bureau of the Public Health Service, Washington, announces that at the present moment several foci of bubonic plague are known to exist at New Orleans, Pensacola and Galveston.

Obituary.

WE regret to announce the death of Lieut.-Genera Bahtie, V.C., K.C.M.G., of the Army Medical Staff Son of the late Mr. John Bahtie, of Dumharton, he was educated in Glasgow University and his service in many corners of the Empire are well known. His death removes a distinguished man from amongst us

Original Communications.

CHAULMOOGRA OIL IN LEPROSY.

By T. A. Henry, D.Sc.,

Director, Wellcome Chemical Research Laboratories.

The announcement in the *Times* of July 10 that Dr. J. T. McDonald and Professor Dean, working in Hawaii, had obtained promising results in the treatment of leprosy with ethyl esters prepared from chaulmoogra oil, brings to a point the results of a number of isolated researches conducted during the last twenty years. It is moreover of special interest from a chemo-therapeutical point of view, since these new results may afford an explanation of the fact that in spite of our fairly complete knowledge of the chemistry of chaulmoogra oil it has so far not been possible to associate with certainty the undoubted remedial value of the oil with any of its components.

Chaulmoogra oil has long been known as a somewhat uncertain remedy for leprosy and various skin diseases, but it was not until 1900 that its exact botanical origin (*Taraktogenos kurzii*) was ascertained, thanks to the work of Sir David Prain. Up to that time it was believed to be derived from the seeds of *Gynocardia odorata*, whence arise such names as "sodium gynocardate" and "gynocardic acid," still unfortunately applied to products made from the genuine oil. It was reasonable to hope that once the true source had been recognized, making it possible to produce an oil of uniformly good quality and free from admixture with other oils, that more certainty would attend its use, and though there is no definite evidence that this has been achieved, it seems possible that the greater interest shown in its use in leprosy in recent years may be due in part to improvement in the quality of the oil obtainable.

Our knowledge of the chemistry of chaulmoogra oil is chiefly due to the work of a former director of these laboratories—Dr. F. B. Power, and his collaborators, who in a series of papers published in 1904—05 dealt exhaustively with the constituents, not only of chaulmoogra seeds, but also with those of *Gynocardia odorata* (false chaulmoogra) and of the closely related seeds of two species of Hydnocarpus, the oils from which are used, though to a much less extent, for the same purposes as chaulmoogra oil. Three of the seeds examined, viz., chaulmoogra, *Hydnocarpus anthelmintica* and gynocardia, contained cyanogenetic compounds, i.e., they yielded prussic acid when ground up in a moist state, due, no doubt, as was proved in the case of gynocardia, to the interaction of an enzyme and aglucoside present in each of the three kinds of seed, just as emulsin and amygdalin react and liberate prussic acid, when bitter almonds are crushed in water. Apart from these constituents none of the seeds yielded any product of interest other than the fatty oil present in considerable quantity in each of them. The four oils extracted from the seeds were sharply differentiated into two groups. Gynocardia oil was proved to consist of a mixture of well-known fatty acids including palmitic, oleic, linolic, linolinic and *iso*-linolinic; it thus resembled the oils belonging to the class known as "drying oils," of which linseed oil is the best known example. The chaulmoogra and hydnocarpus oils, on the contrary, although they contained some ordinary fat acids, had as their chief components members of a new series of acids (of which two, chaulmoogric and hydnocarpic, were isolated in a pure state and characterized) which differed from ordinary fat acids in being optically active and in possessing as a part of their molecular structure a ring or closed chain of carbon atoms. It was natural to suppose that any remedial value possessed by chaulmoogra and hydnocarpus oils must be due to these peculiar acids; but although a considerable amount of work was done at that period on this point, it seemed to be clear that better results could be obtained from the use of the raw oils than from any single derivative. Since then considerable improvements, especially in the technique of administration, have been effected by the labours of Sir Leonard Rogers and those associated with him in India, and by other workers. Chaulmoogric and hydnocarpic acids, the two definitely known members of this series, yield sodium salts which are sparingly soluble in water, and are therefore unsuitable for injection. The other acids of the series appear to be lower homologues of these two and to yield more soluble salts, but they have not so far been isolated in a pure state, and they undoubtedly occur mixed with some ordinary, unsaturated fat acids. It is this mixture which in the form of sodium salt constitutes the bulk of sodium "gynocardate" which has been used in the treatment of leprosy. The replacement of these sodium salts of the acids peculiar to this group of oils by their ethyl esters, first prepared by Power and his co-workers in 1904-05, which appears to be a special feature of the new work in Hawaii, is distinctly advantageous since it renders possible the trial of pure preparations of even the higher acids, ethyl chaulmoograte and hydnocarpate being both limpid yellow oils, which, mechanically at least, are eminently suitable for injection. Dr. Balfour informs me that a mixture of ethyl esters prepared from chaulmoogra oil was being used with some success for the treatment of leprosy in Venezuela in 1915.

Messrs. McDonald and Dean's work is probably a continuation of that done by Messrs. Hollmann and Dean, of which some details were published last year, from which it appears they used the ethyl esters of four fractions of chaulmoogra oil acids. Their method of fractionation is less elaborate than that adopted by Power and his co-workers, but on the basis of the latter's results it is possible to work out with some degree of probability the approximate composition of Hollmann and Dean's fractions, and to suggest their probable relationship to the various sodium salts used by Rogers and other workers.

Hollmann and Dean state that although all four fractions produced reactions on leprous lesions when injected subcutaneously, fractions C and D appeared to act most rapidly, though the number of cases treated was then too small to permit of a final expression of opinion on the point.

Hollmann and Dean's fractions	Probable composition. Ethyl esters of	Corresponding sodium salt
A	Chaulmoogric acid	Sodium chaulmoograte.
B	Hydnocarpic and chaulmoogric acids	
C	Lower homologues of chaulmoogric series with some chaulmoogric and hydnocarpic acids and some unsaturated ordinary fat acids	Corresponds approximately to sodium gynocardate, which Rogers[1] first used, but which he gradually improved by replacing more and more of the lower melting point acids by hydnocarpic and chaulmoogric acids, thus approaching fraction B.
D	As C, but the unsaturated ordinary fat acids replaced by palmitic acid	

On the whole, the evidence seems to indicate that it is the acids of the chaulmoogric series to which chaulmoogra and hydnocarpic oils owe their value, and that possibly the lower homologues are the more active members of the series. Whether this action on the bacillus of leprosy and other acid fast bacilli is, as the work of Walker and Sweeney in California suggest, specific to acids of this type or is merely a special case of a more general action on such bacilli exerted by low melting unsaturated acids or their esters, as appears to be indicated by recent work by Rogers and others, only further research can determine.

It is now over twenty years since the work outlined in this note was begun. With adequate facilities for research in those regions of the Empire in which leprosy is prevalent, the point now reached could have been attained long ago. Though opportunities for research in tropical diseases have been increased in recent years through the foundation of Institutes for Medical Research, and in other ways, in the British tropics, so that much useful work has been, and is being done, the facilities are still far from adequate. With the example in front of us of what can be accomplished in this country by comparatively small financial means when the work is directed into the channels of greatest importance and most urgent need by such a body as the Medical Research Council, it is to be hoped that the authorities concerned will in the near future constitute an analogous body to take in hand the problems of tropical medicine. The necessity of dealing with these problems should weigh heavily with this country, since the promotion of the physical well being of the native populations in the tropical areas we have undertaken to govern, should be a first and most important part of our duties.

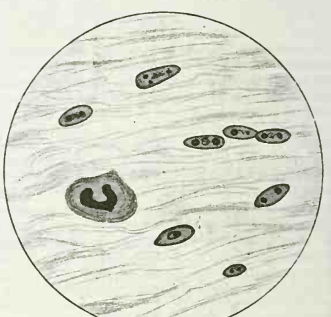
NOTES ON SOME CASES OF CASTELLANI'S BRONCHO-MONILIASIS.

By I. Jacono, M.D.,

Physician, Naval Hospital, Naples.

For the last two years I have examined for presence of fungi—using Castellani's methods—a number of cases of bronchitis in which tubercle bacilli were always absent. The sputum was collected in sterile receptacles with every precaution, the patient rinsing his mouth and gargling with a permanganate solution (1 in 5,000) before expectorating. In each case particles of the muco-pus were washed in sterile broth and then several glucose agar tubes were inoculated. Some tubes were incubated at 37°, others at 28° C., others were kept at room temperature. After 48 hours the tubes were examined and any white monilialike colony were further investigated microscopically and bacteriologically. Every strain of monilia found was passed through the principal sugars and its action on gelatine and serum was noted.

Case 1.—Young sailor with no family history of tuberculosis. Complained of cough with muco-purulent expectoration for the last two months. His general condition is good, no serotine fever. The physical examination of the chest reveals no zones of dullness; there are moist râles, especially on auscultation of the left apex. Cuti-reaction negative. The examination of the sputum repeated many times shows absence of tubercle bacilli, instead several round



Sputum in a case of Broncho-moniliasis.

bodies with a double contour and Gram positive are seen. The sputum is sown in glucose agar and a monilia-like fungus is isolated (B. 12), the biochemical characters of which are collected in the table. This fungus is probably *Monilia balcanica* Castellani.

Case 2.—Sailor from a torpedo-boat. Has had symptoms of bronchitis for the last six months. Very little expectoration. The patient is very pale and has lost flesh. Cuti-reaction negative, tubercle bacilli and *Spirochæta bronchialis* absent. A monilia-like fungus is isolated (B. 20), the characteristics of which can be seen in the table. It is probably *Monilia krusei* Castellani.

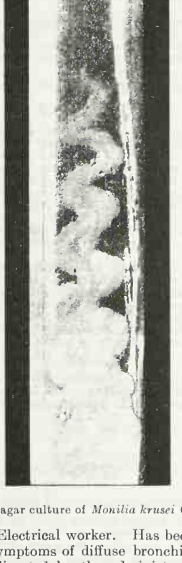
Case 3.—Sailor. Symptoms of acute bronchitis with fever and rather scanty muco-purulent expectoration. Tubercle bacilli negative. A fungus is isolated (B. 21) with the characters of *Monilia parakrusei* Castellani.

Case 4.—Sailor. Has been ill for the last six months serotine fever, has already lost weight. The physical examination shows clearly symptoms of broncho-alveo

[1] See especially *Indian Journal of Medical Research*, 1917, vol. v, No. 2, pp. 277-300.

litis of the right apex, but the sputum shows constant absence of tubercle bacilli, cuti-reaction negative, and the inoculation of the sputum in a guinea-pig gives also a negative result. A fungus is isolated (B. 33) with the biochemical characters of *Monilia tropicalis* Castellani.

Case 5.—Sailor. Acute bronchitic symptoms with mucous expectoration, slightly blood. Moist râles all over. Cuti-reaction negative, tubercle bacilli and *Spirochæta bronchialis* absent. A fungus is grown (B. 38) with the characters of *M. guillermondi* Castellani.



Glucose-agar culture of *Monilia krusei* Castellani.

Case 6.—Electrical worker. Has been ill for three months. Symptoms of diffuse bronchitis, which are greatly ameliorated by the administration of iodine preparations. Cuti-reaction negative, tubercle bacilli absent. In fresh preparations of the sputum no fungal bodies are seen, but cultures show growth of a hyphomycete (B. 40) with characters of *M. parabalcanica*.

The fungi I have isolated belong to the genus monilia, as defined by Castellani, Pinoy, and Chalmers, and are therefore probably cases of bronchomoniliasis, the form of bronchomycosis first fully described by Castellani, whose work has been confirmed by Chalmers and others. Castellani for practical purposes distinguishes several types of monilias: (1) *Monilia balcanica* Cast. group. Glucose is the only sugar fermented with production of gas: (2) *Monilia krusei* group. Fermentation with gas production, of

	Glucose			Levulose			Galactose			Maltose			Lactose			Saccharose			Inulin			Dextrin			Litmus Milk			Mannite			Gelatine			Serum			Colour
	48th day	84th day	132th day	48th day	84th day	132th day	48th day	84th day	132th day	48th day	84th day	132th day	48th day	84th day	132th day	48th day	84th day	132th day	48th day	84th day	132th day	48th day	84th day	132th day	48th day	84th day	132th day	48th day	84th day	132th day	48th day	84th day	132th day	48th day	84th day	132th day	
Monilia B 12	AG	A	A	A	A	A	A	A	A	A	A	A	A	AS	AS	A	A	A	AS	AS	AS	AS	AS	AS	A	AS	AS	A	A	A	0	0	0	0	0	0	White
Monilia B 20	AG	AG	AG	AG	AG	AG	0	0	0	0	0	0	AS	AS	AS	0	0	0	0	0	0	0	0	0	A	A	A	0	0	0	0	0	0	0	0	0	White
Monilia B 21	AG	AG	AG	AG	AG	AG	A	A	A	A	A	A	A	A	A	A	A	A	0	0	0	0	0	0	AC	AC	AC	0	0	0	0	0	0	0	0	0	White
Monilia B 33	AG	AG	AG	AG	AG	AG	AG	AG	AG	AG	AG	AG	0	0	0	AG	AG	AG	0	0	0	0	0	0	0	0	0	A	AS	AS	0	0	0	0	0	0	White
Monilia B 38	AG	AG	AG	AG	AG	AG	0	0	0	AG	AG	AG	0	0	0	AG	AG	A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	White
Monilia B 40	AG	AG	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	AS	AS	AS	AS	AS	AS	AC	AC	AC	0	0	0	0	0	0	0	0	0	White

Abbreviations used in the table:—A = acid; G = gas; C = clot (milk); S = slight; O = negative result—viz., neither acid nor clot in milk, neither acid nor gas in sugar media, non-production of indol; non-liquefaction of gelatine or serum as the case may be.

glucose and levulose. (3) *Monilia pinoyi* Cast. type. Fermentation with gas production of glucose levulose and maltose. (4) *Monilia metalondinensis* group. Gas fermentation of glucose, levulose, maltose, and galactose. (5) *Monilia tropicali* Cast. group. Gas fermentation of glucose, levulose, maltose, galactose and saccharose. (6) *Monilia guillermondi* Cast. group. Gas-fermentation of glucose, levulose and saccharose. (7) *Monilia macedoniensis* group. Gas fermentation of glucose, levulose, galactose, saccharose and inulin. (8) *Monilia pseudo-tropicalis* group (very rare). Gas fermentation of lactose in addition to other sugars. (9) *Monilia zeylanica* Cast. Absence of gas production in any sugar.

As shown by the table the monilia fungi I have isolated belong to the *Monilia balcanica* Castellani group, *Monilia krusei* Cast. group, *Monilia tropicalis* Cast. group, *Monilia guillermondi* Cast. group.

I hope the cases I have recorded, confirming the previous work of Castellani, Pinoy and Chalmers, may perhaps cause more attention to be paid to the subject of bronchomoniliasis and bronchomycoses in general, a subject of great practical importance from the point of view of diagnosis and prognosis, as such cases are generally mistaken for pulmonary tuberculosis.

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Chalmers and MacDonald (1920), Journal of Tropical Medicine and Hygiene, January 1st.

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The Cultivation of a Trypanosome from the Blood of Panamanian Cattle (Oscar Teague, M.D., and Herbert C. Clark, M.D.), *Proceedings of the Medical Association of the Isthmian Canal Zone*, July, 1917 to December, 1917, vol. x, Part 2, July 20, 1917.—The authors have found trypanosomes in the blood of cattle from several different districts of Panama and have demonstrated the fact by making cultures. Broth or blood agar was generally used. The temperature at which the cultures are grown and the osmotic pressure of the medium are important factors to obtain successful results. The trypanosomes disintegrate at body temperature and multiply at temperatures between 22° and 28° C. The medium should contain enough salt to make it isotonic with the blood to be cultured. Two c.c. of defibrinated blood are added to 10 c.c. of broth; five or six tubes being prepared from each animal. The cells settle to the bottom of the tube and remain in fairly good condition for a week or ten days. After twenty-four hours incubation at 26° C. no trypanosomes are found; a few may appear after forty-eight hours and on the third or fourth day they may be present in large numbers. The authors are now conducting experiments with the cultures and with the blood of cattle harbouring trypanosomes, and hope to make a further communication later on.

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THE JOURNAL OF

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October 15, 1920.

SOME ASPECTS OF POISONING IN THE TROPICS AND SOME OF THE MORE COMMON VEGETABLE POISONS MET WITH IN THE TROPICS.

Poisoning as practised by natives in several tropical countries has become a fine art practised by "specialists" or professed poisoners, and know

locally as abortionists, bone-setters and similar quacks in other countries. Their services are not infrequently called in quite openly by the authorities of the tribe or sect to get rid of lives under various circumstances:—

(*a*) For the destruction of enemies their services are called for in a sense similar to that in which the Germans introduced gas on the battlefield and with equally devilish intent.

(*b*) For the removal of rivals in love.

(*c*) For hastening the end of persons suffering from incurable or foully smelling ailments, such as gangrene, widespread ulcerations, especially of the face and exposed parts, cancers of the breast and other organs that have ulcerated.

(*d*) Family feuds handed down from father to son through several generations are settled in this way, especially when the hate bearers cannot meet owing to distance, or when the more cowardly of the combatants shuns personal conflict.

(*e*) To get rid of deformed children.

(*f*) To get rid of "surplus" children. One frequently hears of natives, and especially the Chinese, drowning children that are not wanted, more especially female children. The truth of this is frequently doubted, for the Chinese are passionately fond of children, and on this account the tale is doubted. But the Chinese are practical above everything in matters of race problems, and the following account of a case of the kind may be interesting.

A patient of the writer's had twins, a boy and girl. Three boys had already been born to the parents, and this therefore was the fourth boy, and the girl twin the only girl in the family. The Chinese nurse (amah) had enough on her hands, for the children were all quite young, not more than eighteen months intervening between any two of the succession. The accession of two to the family the amah regarded with distavour, and she evidently made up her mind to get rid of one of the twins, because she said: "Missussee no wantee more boy." The fact, of course, being that she (the amah) found the twins an inconvenience to nurse, and decided to get rid of one—the boy. In course of time—a few months—the boy's health became indifferent, appetite grew less keen, strength flagged, the features became more puffy, the boy's natural joyousness left him and he became more solemn, and his skin of an ashen grey colour. Various remedies were tried in the way of diet and drugs but nothing did any good, the amah meantime protesting that the child was "all proper." Gradually it became evident that something out of the way was amiss, and my medical colleague, Dr. Wm. Hartigan, suggested that it might be poisoning, as he had seen a similar case before. He suggested "datura" poisoning as the possible cause, and on observation the signs and symptoms fulfilled the "textbook" description of poisoning by this drug. The process was very insidious and slow, the amah being clever enough to make it appear that the child, being a twin, was backward and in a "decline." So ill and listless did the boy become that the writer had the child removed to his own house and placed it under a skilled English child's nurse. Gradually the child recovered, lost all symptoms of backwardness, and in a month's time was quite well and robust. At the end of two months the mother removed the child from the writer's house to her own. Very shortly the previous symptoms recurred, and the amah, afraid of the child being removed again, increased her poisonous doses and the child died rather unexpectedly. Datura is a well-known and commonly used drug in China for poisoning purposes. This amah was a very clever woman, intelligent to a degree, and conducted her "case" in an expert manner. According to her "light" she probably saw nothing amiss in her conduct, but believed no doubt she was doing a good turn to her mistress.

It may be interesting to know that this amah the writer has described elsewhere as being the first woman in China who recovered after the removal of an ovarian tumour of large size; the ovarian cyst and contents weighed after removal 81 lb., and the woman herself subsequent to the operation weighed 1 lb. less, namely, 80 lb.

(*g*) Another reason for the Chinese making use of poison is in connection with insurance.

Some twenty-five years ago the Chinese took to insuring their lives, and the Americans and some of the American agencies, as well as insurance companies of other countries, took up this line of business. British insurance companies declined to have anything to do with any widespread dealings in these matters, and only with a few of the Chinese of standing and British subjects of well-known positions in the commercial world did they now and again have life insurance dealings.

The relations of the doctor to such wholesale insurances were seldom in the way of preliminary examinations, as most of the insurance companies anxious for business took the Chinese premiums of insurance without any previous medical examination, so that Chinamen and their families took out insurance policies, and if any member was delicate the more readily did they do so. The trouble came later, of course; when any one of the insured died the question of paying the insurance due was always a vexed problem. The claim if not paid within thirteen months, according to agreement, lapsed, and delay in settlement was therefore a paying concern to the company, and unless claims were settled within a specified time the client's relations lost the money. The way out of it was to get the person that was ill identified by a European doctor previous to death and to give a certificate that the patient was ill and that he could not live more than, say, four or six or eight weeks. It is to settle this latter point that the doctor is called upon, and the friends will press the doctor to say exactly whether he will live four or six or eight weeks. If the doctor mentions any of these dates the insured patient will most certainly die on one of these days—the one the doctor perhaps rather casually mentions. The doctor is requested to write the date down, state what is wrong and how long the patient will live; this is shown to the

insurance agent the moment the patient dies, and the claim enforced with the European doctor's certificate as a witness that this is the person who died. The insurance agents have, of course, another loophole of escape, viz., that one Chinaman is so like another that they cannot tell whether the dead man is the insured man.

The interesting point from the medical point of view is that the sick man—the insured man—dies to date, no doubt by poison. The doctor unacquainted with such proceedings amongst natives may and often does hasten the sick (insured) man to his end. If he in a casual way says, "Well, I should not think the patient can live more than a fortnight," the poor man will be done away with in a fortnight to the minute, so that the doctor unconsciously may be the man's executioner.

There is no space to discuss even the more common vegetable poisons used in the tropics. A few of the more common are:—

Aconite, although a native of the northern temperate zone, has been imported into India and China and used as a medicine, but especially as a poison.

Calabar bean (*Physostigma venenosum*) and its active principle physostigmin (eserine) is met with only in Africa, and used there as an "ordeal" poison.

Cassava (bitter cassava)—*Manihot utilissima*—a native of Brazil, is cultivated there for food.

Java bean (*Phascolus lunatus*) is the wild form of the haricot bean, and it is now distinguished from the cultivated variety by its brownish or purple beans, whereas the haricot bean itself is white.

Mushrooms in the tropics are found to be poisonous in the same way as they are in temperate climates.

The treatment for the several poisons mentioned above is a hypodermic injection of atropine gr. $\frac{1}{60}$, repeated if necessary.

(To be continued.)

Early Use of Convalescent Serum in Influenza (F. D. Francis, M. W. Hall, and A. R. Ganies, *The Military Surgeon*, Aug., 1920).—During the epidemic of influenza at Fort Saen, Houston, Texas, in January and February, 1920, the serum from early cases of influenza before secondary infections had developed was injected intramuscularly in doses of 50 to 100 c.c. on from one to three occasions in 26 cases of influenza of special initial severity. Compared with 219 cases treated without serum the mortality was reduced from 6 to 0 per cent, the average days of fever from 5·8 to 3·6, and the percentage developing pneumonia from 30 to 4. When such results can be obtained with serum as relatively poor in immune bodies as that of convalescents, it is to be expected that ultimately with the discovery of the primary cause of the disease a potent autoserum may be developed. Meanwhile this method seems so promising that it should be employed when it is possible to obtain a supply of the serum.

Abstracts.

THE VITAMINES.[1]

By WALTER H. EDDY.

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HISTORICAL.

THE name "vitamine" was given to these substances by Casimir Funk. Since 1911, when he suggested this name for the substance (isolated from rice polishings and yeast), which was curative of polyneuritis in birds or beriberi in man, the study of this substance has been much extended, and the importance of the types now classified under this name as related to diet, growth and scurvy has increased in proportion to the progress made in investigation. To-day three types are under investigation under the names of "fat-soluble A," "water-soluble B," and "water-soluble C."

While the name "vitamine" was first applied by Funk in 1911, the suggestion of its presence and significance antedates his work. Previous to 1909 a number of attempts had been made to nourish animals on diets composed of purified proteins, fats, carbohydrates and salts. Such attempts were usually attended with failure. These earlier studies are well summarized by McCallum in the *American Journal of Physiology*. He calls attention to the fact that some of the first experimental work suggesting the requirement of accessory substances in the diet is found in the work done by Stepp. In attempting to estimate the importance of lipoids in the diet, this author showed that by the extraction of bread and milk with ether-alcohol something was taken away that rendered the mixture inadequate to support life in mice, and that when the extracted material was restored to the diet the food became efficient once more. Stepp thought, of course, that the substance extracted was a lipoid, but was unable to obtain the same result by substituting for the extracted substance any known lipoid. Here then was a suggestion that ether-alcohol extracts from diets something that is not fat and which is essential to the diet.

The actual discovery of the substances now classed as "vitamines," "food accessory substances," "fat-soluble A," "water-soluble B," &c., came about through the work in two distinctly different fields, which later converged as the substance sought in each field was seen to be identical.

In 1897 Eyckman had shown that polyneuritis could be induced in fowls by restricting them to a diet of polished rice, and that a diet of undecorticated rice would cure fowls in this condition. In the Philippines the subject had been

[1] "Abstracts of Bacteriology," vol. iii, No. 6, December, 1919, p. 313.

under extended investigation by a number of American workers. In 1907 Fraser and Stanton showed that the alcohol extracts of rice polishings would relieve experimental polyneuritis. In 1911 Funk took up the study of the problem, and showed that pressed yeast, hydrolysed with 20 per cent. sulphuric acid for twenty-four hours, retained its property of curing polyneuritis when administered to birds. Funk had previously been interested in this problem, and his contributions from 1909-1911 were preliminary to his statement that in yeast and in rice polishings there was present a chemical entity of a basic nature which he named "vitamine." The fact that this substance was precipitable by phosphotungstic acid, and therefore an organic base, was announced simultaneously by Funk and by Suzuki working independently of one another. From 1911 to 1915 this announcement was followed by further attempts by Funk and others to determine the nature of the new substance. The significant papers in this series will be discussed in detail in the later topics of this article. Suffice it here to note that the presence of the substance was established, its anti-neuritic property confirmed and its chemical nature suggested, but not established. In fact, it soon became clear that the term "vitamine" was in some respects ill-chosen. Hopkins, in England, suggested the term "accessory food substances," and later McCallum suggested the specific terms "fat-soluble A" and "water-soluble B" to identify the unknown dietary factors. The controversy over the nomenclature has some historical interest, and McCallum's point of view and Funk's defence of his name are set forth in various articles. As a matter of fact, however, usage has settled the controversy by retaining the name "vitamine" to designate the class of substances and the terms "fat-soluble A" and "water-soluble B" to specify the class referred to. The pursuit of the pathological phenomena of beriberi, therefore, led up to the naming of vitamines. Let us now consider the parallel line of endeavour that in 1911 merged with it in search of vitamines and their properties.

In 1911 Osborne and Mendel reported a series of experiments involving the study of the effect of feeding purified proteins and mixtures thereof with other purified nutrients. In these experiments they called attention to the peculiar growth effects induced by the use of a preparation called by them "protein-free milk." A little earlier Hopkins had called attention to the fact that the addition of milk to purified food mixtures produced results out of all proportion to the calorie value of the milk. In 1912 McCallum and Davis showed that butter fat and egg yolk contained something that stimulated growth and was absent in lard and olive oil. A publication by Hopkins in this year also bore upon the same matter. The discovery of these facts simultaneously with the announcement of the discovery of vitamine in rice polishings and yeast suggested the possible identity of the two substances. Hence, since 1911, the different schools of workers have converged upon the problem. Osborne and Mendel pursued their studies of purified mixtures with the view of extending their conclusions to explain the reaction of the accessory substance in butter fat and protein-free milk. McCallum and his co-workers began the series of studies upon the dietary efficiency of cereal grains and other food-stuffs that in 1915 led to the proposal of the A and B terms as describing the factors necessary to growth and limiting the anti-neuritic properties of the "B" vitamine.

The revival of interest in the subject of scurvy during the past two years and the present state of the investigations has warranted Drummond in suggesting that the anti-scorbutic vitamine be classified as "water-soluble C."

Methods of Preparation.

The earlier methods of preparation aimed at establishing the properties and chemical identity of the vitamine. These methods may be gleaned from the earlier papers of Funk and his co-workers, but the student is especially referred to references 18 and 19 in which Funk has summarized these experiments. Quoting from one of these articles, Funk states the original method to be as follows:—

Rice polishings were extracted with cold absolute alcohol which was partially saturated with gaseous HCl. The extracts were evaporated *in vacuo* at a low temperature, and the fatty residue melted and extracted with water. These aqueous extracts were precipitated with 50 per cent. phosphotungstic acid solution after addition of sulphuric acid to the extent of 5 per cent., and the precipitate decomposed in the usual way with baryta. The solution, entirely freed of baryta and sulphuric acid, was filtered, and the filtrate neutralized with HCl and evaporated *in vacuo*. The residue was extracted with alcohol, and the solution freed by filtration from the inorganic chlorides. The alcohol solution was then precipitated with alcoholic mercuric chloride solution. The active substance was found to a small extent in this precipitate, but the bulk was in the filtrate. From each of these fractions vitamine could be completely thrown down by use of silver nitrate and baryta. From this fraction, after decomposition with hydrogen sulphide, there was isolated a very small quantity of a crystalline substance with a melting point of 233° C. This was not recrystallized and possessed very marked curative power.

This substance was afterwards shown to be impure nicotinic acid.

Funk extended his study of the phosphotungstic precipitate, and improvements were devised for the fractioning of this precipitate. It was found that if the phosphotungstic precipitate were rubbed up with acetone a large part of it went into solution and that the vitamine remained in the smaller insoluble fraction. It was also found that baryta appeared to have a destructive influence on the

vitamine, and neutral lead acetate was substituted to break down the precipitate. Another feature that developed was the fact that autolysed yeast yielded larger quantities than could be obtained by extraction of the material without autolysis. These and other features were incorporated into the methods, and are fully treated in the articles referred to.

The desirability of obtaining the vitamine in active form for experimental use, and at the same time of avoiding the slow, tedious process of preparation noted above, has developed other methods of extraction.

The procedure devised by Seidell is as follows:—

(1) Autolyse the yeast at 40° C. for forty-eight hours.

(2) Filter off the extract and add 200 grm. of fuller's earth to each litre of the extract. (Seidell used the particular form of fuller's earth known as Lloyd's reagent.) Shake for fifteen minutes.

(3) Filter off the earth on a hardened paper in a Buchner funnel, dry to constant weight in a vacuum desiccator over sulphuric acid, and use as desired.

Kaolin and similar substances have not proved substitutes for fuller's earth in this process. Bone black absorbs some of the vitamine, but not with the efficiency of the earth.

A third method of obtaining vitamine for experimental purposes has been devised and reported by McCallum. The method consist in the following steps:—

(1) Extraction of the material with alcohol-free ether on the Soxhlet apparatus until all fatty matters are removed. Ether will not extract B vitamine.

(2) Hot alcohol extraction of the residue from the ether extraction by Soxhlet or Caldwell method. This removes the vitamine, and apparently in neutral or acid reaction the vitamine will stand boiling for hours without deterioration.

(3) Deposit of alcohol extracted vitamine on dextrin by evaporation and use of this activated dextrin as material for experimentation. Or dissolve the vitamine from the dextrin with benzene and thus further purify it. (Benzene will not extract vitamine from the raw material, but will extract it after it has been deposited from alcohol extract on dextrin.)

The methods described above apply to the extraction of the anti-neuritic vitamine of water-soluble B. The fat-soluble vitamine presents certain peculiarities that must be considered in its extraction.

While soluble in fats and extractable through the agency of ether from butter and milk and such animal tissues as contain it, McCallum has pointed out that isolated plant fats as obtained either by ether extraction or by hot pressing do not contain the fat-soluble A.

Suitably planned feeding experiments have shown that it is the fat-free residue of the seed that still retains the content of the substance that was originally present in the seed. We have demonstrated this only in the case of the maize kernel and the flax seed, but the experiments of Richardson and Green indicate that cotton-seed flour still contains a fair amount of this dietary factor. We have shown that cotton-seed oil is without the peculiar growth-promoting property which it would show if it contained this substance.

We have obtained potent preparations as follows: Spinach leaves and young clover respectively, dried in a current of air at about 60° C., were extracted with U.S.P. ether. The resultant green extract, yielding an oily residue equal to about 3 per cent. of the dried plant, was evaporated upon starch. These preparations, fed in daily quantities equivalent to 1 to 2 grm. of dried plants, promoted recovery and renewal of growth in rats declining in weight on diets deficient in fat-soluble vitamine. Inasmuch as only 30 mg. per day of the ether extract of spinach sufficed for this purpose, it appears that this substance ranks among the most potent of the oils heretofore tested.

In practice the presence of fat-soluble A is determined by feeding a diet suitable in all other particulars, and then using the suspected substance to supply the "A." Another method is to add to such a diet a sufficient amount of butter fat to secure normal growth and thus determine the sufficiency of the suspected substance in terms of the butter fat standard. McCallum uses the following diets in testing substances for the water-soluble B, and similar ones minus the butter fat and with the "B" vitamine for testing the "A."

The extraction of the anti-scorbutic vitamine "C" has merely progressed sufficiently to demonstrate that it is neither "A" nor "B" and to justify its name.

Source of Vitamine.

In the absence of any satisfactory quantitative measurement for vitamine, it is impossible to indicate absolutely the amounts of any type in a given source. The system adopted above aims to show the relative abundance. (+ + +) indicates abundance; (+ +) sufficient to require no supplement in feeding experiments where the source indicated is the sole supply; (+) present, but not in sufficient quantity to be relied upon as the sole source; (−) means absent or so little as to be negligible; (?) undetermined.

Reaction of the Vitamines to Heat, Acids, Alkalies and Solvents.

The question of the effect of heat, acid and alkali upon extracts of vitamine or upon these vitamines *in situ* is still unsettled, and it is impossible to speak dogmatically.

The following statements of a few investigators on this subject are presented to bring out the variations in the point of view and the necessity of defining the effects of heat, &c., in terms of particular vitamines and sources rather than in generalized conclusions.

Chamberlain, Vedder, Williams and others, and Funk early showed that hydrolysed preparations were more rather than less active and suggesting the resistance to acid. McCallum and Davis showed that milk whey, wheat embryo and crude lactose could apparently be heated for one hour under 15 lb. pressure without destruction of the water-soluble B. Osborne and Mendel confirmed these views in the study of the protein-free milk. Osborne and Mendel also pointed out the failure of live steam to destroy the fat-soluble A in butter fat, and at the same time called attention to the fact that butter fat allowed to stand at room temperature for several months gradually lost its potency. Steenbock and his workers have recently maintained that heat may destroy the "A" vitamine in butter fat. They explain the failure of other investigators to note the destructive action as due to the high initial content of the substance used by these investigators and the use of biological tests whereby partial destruction was not observable. Chick and Hume call attention to the same feature. They hold that temperatures above 100° C. decidedly affect the stability of the "B" vitamine. They report that forty minutes' exposure to a temperature of 113° C. reduced the potency of the solution used to one-half that of the unboiled control, and that two hours' heating at 118° to 124° C. reduced the efficiency of the solution to less than one-fourth of the unboiled control. They urge the necessity of quantitative methods in such studies.

On the alkali side of the question, Williams and Seidell have extracted vitamine "B" from Lloyd reagent adsorption product with strong alkali and found the extract potent to a high degree. On the other hand, McCallum has shown that wheat embryo "B" heated with alkali is very quickly destroyed.

Daniels and McClurg call attention to the fact that the effects of heat and reagents upon vitamines in extract and the like must not be confused with the behaviour of these substances *in situ*. An extensive series of experiments conducted by them on the cooking of vegetables with and without the addition of alkali shows that under these conditions neither heat nor dilute alkalies proved destructive to the vitamine.

In general, then, the views stated in the first paragraphs of this topic hold. Only specific tests should be accepted as guaranteeing safety under any given condition. There is great need for the development of quantitative research in this particular field.

The relation of vitamine "B" to solvents has been reported by McCallum with the following observations: Vitamine B may be extracted with alcohol or water, but is not extractable with ether, benzene or acetone. On the other hand, after extraction with alcohol and deposit upon dextrin, the dextrin deposited vitamine may be dissolved in benzene, but not in acetone. In the same report McCallum observes the great stability of the "B" to nitrous acid and HCl.

The peculiar relation of the "A" vitamine toward ether extraction is explained by McCallum as follows: He suggests that the reason for the failure of ether extraction of plant tissue to remove the "A" vitamine with the fat is due to the chemical union of the "A" in the plant tissue in a form that is not soluble in ether, and that during digestion and absorption of plant tissues this vitamine is set free from this binding, and being readily soluble in fat passes into the animal fat, and is afterwards removable with this animal fat by ether extraction. Whether this is the true explanation or not the facts are as stated. Cotton seeds contain the "A," cotton-seed oil does not.

In a recent paper Sugiura and Benedict have shown that X-ray emanations are destructive to the vitamines of yeast.

The Chemical Structure of a Vitamine.

Funk attributed the vitamine properties to nicotinic acid, adenine and other substances allied to purins and pyrimidines, since these substances were the invariable end-products of his methods of extraction. Funk's work was not pioneer in this direction, but while the chemical nature of the vitamines remains unknown to-day, his researches contributed methods of study that must be considered carefully by the student of this phase of the subject. Closely allied to Funk's idea has been the theory advanced by Williams and Seidell, in which they try to show that vitamines are tautomeric substances existing in active and inactive form. They suggest that vitamine is a pseudo-betain, and Williams has shown that alpha-hydroxyl-pyridine possesses anti-neuritic power that is lost on standing. These theories above noted refer to the anti-neuritic or "B" vitamine.

Steenbock has recently advanced a theory in which he suggests that the "A" vitamine may be a yellow pigment or a substance closely allied to the yellow pigments. The idea has sprung from the association of the "A" vitamine with yellow pigment, e.g., it is present in butter and egg yolk fat, but absent in lard; yellow corn contains considerably more of it than white corn. Such facts tend to lend support to the idea. In the references presented on these theoretical phases there has been included a set of references to the work of Palmer on the yellow pigments as contributory to the last-named theory and its development.

The Explanation of the Methods in which Vitamines Function.

The inevitable sequence to the discovery of the vitamines was the tendency to attribute to them direct relationship with all matters of dietary deficiency. Thus growth, polyneuritis, pellagra, sprue, marasmus, scurvy, &c., presented problems which it was hoped the study of vitamines might solve. Workers in each field have endeavoured to secure evidence of the relation of vitamine to the particular disease. The results vary with the

disease studied. Pellagra and sprue, for example, have not yet been demonstrated to be linked definitely with vitamine activity. Growth, polyneuritis, xerophthalmia in rats have been shown to be directly related to the activity of the "A" and "B" factors. Marasmus has shown some evidence of connection with the two vitamines, and scurvy has been linked with the "C" vitamine. In the study of these diseases and of growth, certain views have been advanced to explain how the vitamine functions in each case, and while none of these views may be considered as demonstrated beyond doubt, it seems worth while to collate them here for the guidance of the student. In this connection it must be borne in mind that empirical results with a curative agent may often develop great progress in practice of medicine without adding much to our actual knowledge of how the agent works.

Polyneuritis and Beriberi.

Funk has noted that when the curative fraction was administered orally or subcutaneously to pigeons suffering from induced polyneuritis the birds recovered speedily, but that it was impossible to keep them on a diet of polished rice permanently even if the injections of the curative substance were made every few days. Williams points out that pigeons restricted to polished rice do not all run the same course. Some never develop polyneuritis but die of starvation. Others recover temporarily from an acute attack without treatment. Eyckman cured pigeons but not chickens with injections of 20 to 40 mg. of a mixture of one part NaC_8 and three parts KC_8. From these studies and his own, McCallum has formulated certain views as to the anti-neuritic vitamine and its method of action. We quote from the article: The following explanation, while purely speculative, may possibly account for the recorded observations and assist in elarifying the confusing data relating to this subject.

Histological methods have shown that in polyneuritic animals there is a degeneration of the motor cells of the cord. This change is progressive; some cells present the normal appearance while others in the same field are degenerated. It would appear plausible that when the motor cell changes have reached a certain point loss of function supervenes and paralysis results. There still remain in the cord of a paralysed animal motor cells which appear normal when stained, and which may be capable of restoring the motor functions of the muscles when influenced by substances which stimulate them to heightened sensitiveness. In other words, the temporary relief of polyneuritis may be the result of the pharmacological action of certain substances rather than a response with renewed function of cells which have been subjected to a selective fast, and later have been supplied with the missing food complex. If this line of reasoning could be shown to be valid, it would follow that experiments with pure chemical substances of known constitution, with a view of finding by good fortune the one playing an important physiological rôle, might be entirely misleading unless it were shown that the "cure" was permanent. For such complete proof it is necessary to demonstrate the resumption of growth and maintenance of health as long as the substance is supplied in the food mixture. Animals which have been brought into a critical condition where death is certain within twenty-four hours, and which have been permanently cured on the addition to the food mixture of a very small amount of a preparation obtained in efforts to isolate the unidentified food factor, furnish absolute proof that the physiologically active dietary factor is being dealt with. Sustained normal function is indispensable to adequate proof that the dietary essential in question is being administered. If this condition should be insisted upon by investigators before concluding that a test is positive, it is probable that we should not have such a list of totally unrelated chemical substances reported as protective against polyneuritis.

McCallum believes that the lack of "A" in a diet is responsible for the eye disease known as xerophthalmia. He believes that the lack of "B" results in polyneuritis. But he does not support the view that there are speeific vitamines present which protect against scurvy, rickets, pellagra, sprue, &c.

Whatever the point of view, the vitamine "B" is now definitely associated with the treatment and cure of polyneuritis.

Growth.

Extensive studies on the nutritive efficiency of various diets and on the specific behaviour of the dietary factors "A" and "B" have shown that both are essential to the normal growth of such experimental animals as rats, swine, fowls, &c., and by analogy or, in a few cases by direct experiment, to human animals. He has recently questioned the necessity for the "A" type in the development of human infants. The details of those experiments may be obtained from the literature of the vitamines, and for convenience the references are divided into two groups, those relating directly to vitamines and those contributory.

Pellagra.

As the vitamine relation to this disease has been merely suggested and not definitely demonstrated, a list of references to the analysis of pellagra diets will suffice to bring out the factors at issue.

Scurvy.

In 1917 and 1918 McCallum tried to show that scurvy was not a deficiency disease. His announcement in this respect stimulated re-investigation of the entire subject. The references cited are not exhaustive, but give sufficient data to show the student why McCallum's view is now considered untenable, and why Drummond is justified in suggesting the name water-soluble "C" to designate the anti-scorbutic factor. The evidence against

the "A" and "B" factors as related to scurvy is well covered in the article by Cohen and Mendel.

This phase of the subject would be incomplete without a reference to Dutcher's work, in which he has attempted to show a relation of the vitamines to oxidative activity. Dutcher observed that the tissues of the polyneuritic birds showed a marked reduction in catalase, and that this catalase activity was restorable by curing birds with vitamine "B." He has tried to deduce from this some relation between vitamines and the oxidative processes. The main difficulty lies in the complexity of the factors that function between cause and effect. The suggestion, however, deserves attention.

INTESTINAL PROTOZOAL INFECTIONS AMONG OFFICERS AND MEN OF THE ROYAL NAVY AND MARINES, DEALT WITH AT THE ROYAL NAVAL HOSPITAL, HASLAR, DURING 1916 to 1918.[1]

By H. A. Baylis, M.A.

(1) What is a Carrier of Amœbic Dysentery?

The importance of carriers of amœbic dysentery, among the Forces and elsewhere, is a question which has become of great moment during the war, and which had not previously received very much attention. We have to consider it from two points of view: (i) the possible danger of carriers to themselves; (ii) their possible danger to their healthy comrades. Before discussing it, however, it may, perhaps, be useful to attempt some definition of what is meant by a "carrier" of amœbic dysentery, and to consider briefly what are the necessary conditions of infection.

A carrier of amœbic dysentery is a person who harbours *Entamœba histolytica* in his intestines, but is in such a relation with the parasite that it is not at the moment producing symptoms of active disease.

In a carrier, a colony or colonies of amœbæ are living under the conditions most favourable for their continued life and reproduction, while their host is probably living in complete ignorance of their existence. In other words, a carrier and his parasites exhibit the relationship most desirable from the point of view of the parasites and least objectionable from that of the host. It is probable that a certain amount of ulceration of the intestine is always going on even in such a carrier case, but we know that such ulceration may occur on quite an extensive scale without giving rise to any disturbing symptoms. The carrier is unconsciously repairing any damage to his tissues caused by the amœbæ just as fast as is necessary to maintain the conditions of equilibrium. At the same time, a certain number of the amœbæ are constantly encysting and being passed out in the fæces for the infection of new hosts. This condition of balance may be regarded as a normal state comparable with the conditions of parasitism by relatively harmless animal organisms such as the great majority of intestinal protozoa and worms.

It is not in the interest of the parasite to produce disease and death to its host, for this ultimately leads to its own extinction. When serious symptoms arise, as in acute amœbic dysentery, we must regard this as a sign of the abnormal upsetting of the delicate balance between parasite and host, and as due to some cause which has prevented the host from being able to repair rapidly enough the damage done by the parasite.

We now know that in the case of *E. histolytica* the infective organism is the encysted stage of the amœba, and that the passage of the cysts is a constant feature of the carrier condition. The person suffering from acute amœbiasis, on the other hand, passes, as a rule, numbers of the active amœbæ, which are swept out of the intestine before they have had time to form their protecting cyst wall. He seldom passes cysts while in the acute stage of the disease. We have experimental proof that infection does not take place through the ingestion of the active amœbæ by the mouth—these are killed during their passage through the stomach. It is the encysted form, the cyst wall of which has to be acted upon by the pancreatic juice in order to liberate its contents, and which is not killed in the stomach, that gives rise to new infections in the same or another host.

It is the carrier, therefore, and not the acute case, who is dangerous to the community in which he lives. The acute case may fall back again into the condition of a carrier, and there is reason to believe that in many cases acute attacks alternate the periods of "carrying." On the other hand, many cases who are found to be carriers have no history of acute onset or periodical attacks.

(2) Conditions of Infection.

Thanks to researches largely carried out during the war, we now have some definite ideas as to the manner in which infection with amœbic dysentery is spread. We know, as stated in the last section, that the cyst of *E. histolytica* is the infective agent. We also know that the cyst cannot withstand drying even for a few minutes, and therefore that it must be kept in a moist state in order to retain its vitality until it can find its way in a new host. Evidence points to the conclusion that there are two chief means of conveyance—water and flies. Wenyon and O'Connor have shown that cysts of *E. histolytica* will survive for over a month in water, provided that the fæces in which they were contained are much diluted. They have also been able to confirm experimentally the suspicion that flies acted as vehicles for the cysts. This takes place, not to any great extent, through the habit of regurgitation on the part of the flies, and probably not at all through infective material adhering to their feet, since in the latter case desiccation would be rapid, and moreover the flies usually clean themselves thoroughly after a feed. The chief mode of spread by flies is by means of their droppings. The cysts have been found to pass uninjured through the intestines of the flies, and to be deposited in their

[1] From the *Journal of the Royal Naval Medical Service*, No. 3, July, 1920, vol. vi.

fæces from five minutes to twenty hours after they have fed on human fæces containing them. This has not only been proved under laboratory conditions, but wild flies caught in Alexandria were found to pass cysts which they had evidently ingested with human fæces in the streets of the native community.

It seems, therefore, that infection may occur either from contaminated water supplies or by eating food on which flies have deposited infected droppings.

(3) Danger of Carriers to themselves.

We are now in a better position to attempt answers to the original question in its two aspects.

With regard to the first, it must be frankly admitted that very little can be said at present. All that we know is that carriers may, after a period during which no symptoms of the presence of the amœba have been observable, develop acute dysentery or hepatic abscess. Wenyon and O'Connor (1917) state that "it is possible that the great majority of carriers eventually show dysenteric symptoms, but as yet we have a very few data to go upon." The data, in fact, are so few that there is no means of estimating what percentage of carriers are likely to become acute cases, and this applies, of course, as much to the Navy as to any other community.

The possibility of re-infection of the carrier himself by means of his own cysts has, of course, to be considered, as well as the possibility of his lapsing into the acute condition without re-infection.

(4) Danger of Carriers to their Comrades.

With regard to this aspect of the question, the facts derived from the study of persons who have not been abroad must have some weight. If there are, as we have seen, reasons for suspecting [Section vi (3)], something like six carriers of amœbic dysentery among every hundred of our adult male population at home, and if the disease, in its acute form, is almost unknown in this country, the danger of carriers would seem to have been much exaggerated. This, however, is putting the case for the harmlessness of carriers in the most favourable light. In reality certain questions are involved with regard to which our ignorance must be confessed. It is possible that cases of obscure intestinal disease occurring in this country might often prove to be due to amœbæ, if the protozoological examination of the patient's fæces were a general practice. We are therefore not in a position to state that amœbic dysentery is really so rare as has been supposed.

Another point to be considered is to what extent the present prevalence of carriers at home may be due to their infection from men who have served abroad during the war. This is a question which can probably never now be answered, since before the war no inquiry had been undertaken, and consequently no data are available.

After all, the question of the importance of carriers is in the main a matter of sanitary arrangements. In a civilian community, where good sanitation is the rule, and similarly under the conditions prevailing in modern ships and in shore establishments, the chances of infection must be very slight. Men of the Royal Naval Division and Marines, who served ashore in the East or in France during the recent war, had, of course, similar chances of infection to those of the Army. We have seen, however, that there is evidence that infection among the naval forces was considerably less frequent than in the Army, and there is reason to believe that the percentage of incidence has been kept low owing to the fact that many of the men examined had not seen shore service abroad, or had only served ashore for very short periods. It is probably, therefore, only in so far as the naval forces are subjected to the conditions of campaigning ashore that the naval carrier of amœbic dysentery becomes a serious problem for consideration.

Prevention of carriers, on the whole, offers greater promise of success than cure under these conditions. The discovery and cure of all carriers presents great difficulties even at home, and it is doubtful whether it is either practicable or desirable in war time. As Wenyon and O'Connor (1917) say, "It may be impossible to isolate and cure every carrier case in a large body of men, but much can be done by the careful use of fly-proof latrines and covered receptacles. With an efficient system of fly and fæces destruction and arrangements for the prevention of flies coming into contact with excreta, there is every reason to believe that amœbic dysentery, as well as many other intestinal disorders, would be very materially reduced, if not entirely eradicated." Valuable suggestions, based on practical experience, as to methods for dealing with the fly nuisance in the field, are made by Austen (1920).

(5) Treatment of Cases and Carriers of Amœbic Dysentery.

It may be objected that it is not the part of the protozoologist to concern himself with the question of treatment. It is nevertheless obviously highly important for the proper co-operation of the laboratory staff and the medical officer in charge of cases that each should know something of, and be to a large extent guided by, the work of the other. Experience at Haslar frequently showed that consultation between the two parties led to more satisfactory results than were attained when the only line of communication was the written laboratory report.

It is by no means easy to cure, even superficially, all cases of infection with *E. histolytica*; still less is it easy to ensure against the occurrence of relapses. Moreover, the value of protozoological reports from the laboratory on the same case at different periods is not a constant quantity—a fact which medical officers who are not protozoologists cannot be expected to realize. At the same time, the laboratory findings are the only means available for deciding whether treatment is effecting a real cure or not. A "clinical" cure may not be very difficult of attainment in some cases, and might be effected without any help from the laboratory.

But the establishment of an absolute cure, consisting in the complete eradication, not only of symptoms, but of the causative organism, depends upon a proper understanding between protozoologist and medical officer.

Original Communications.

ON THE PRESERVATION OF THE ANTI SCORBUTIC PROPERTIES OF CABBAGE BY DRYING.

By Professor Axel Holst and Theodor Frölich, M.D.

From the Hygienic Institute of the University of Christiania, Norway.

We have published previously [1], a series of results concerning the experimental scurvy of guinea-pigs, sbowing that the causation and prevention of this disease coincides, in all tbe main features, with the practical experiences concerning human scurvy.

Dr. V. Fürst [2] has also published records of his research work along with one of our last papers on this subject. He has shown, at the Hygienic Institute of the University of Christiania, that ordinary dry peas and grain, wbich do not prevent the experimental disease, acquire pronounced antiscorbutic properties when moistened and allowed to germinate. This process converts them into "fresh vegetables."

The experiments of Dr. Fürst have been repeated by other scientists. A most interesting series of researches have been carried out in the Lister Institute of Preventive Medicine in London, where Chick, Hume, Skelton and Delf [3] have obtained corresponding results. Also British soldiers during the war have practised tbe germinating method with success [4]. It is a useful remedy against scurvy, when fresh vegetables are not obtainable. It may, however, in emergencies, be useful to be able to substitute ordinary fresh vegetables treated in a different way. We bave tried, therefore, to retain the antiscorbutic properties by a process of drying.

We have been experimenting, for these purposes, with ordinary cabbage. We have shown, in our previous papers, that if cut in thin slices and dried (fer about a week) on the shelves of an incubater at 37° C., this vegetable loses its antiscorbutic properties when kept in an open vessel. This result coincides witb tbat of otber scientists [5], as well as with experiences of human scurvy. But, unlike the leaves of dandelion, the cabbage does not lose these properties immediately on heing dried. The properties are lost little by little during some months, and perceptibly faster when the cabbage is kept at the laboratory temperature, that is about 18 to 20° C., than when kept at 37° C. in an incubator [6].

Endeavouring to explain the cause of this difference we found that the relative moisture of the air of eur laboratory rooms was about twice as much as that ef the incubator. We therefore came to the conclusion tbat the loss of the antiscorbutic properties of dried cabbage might be due, at least to some extent, te the moisture of the surrounding air. Working en this hypothesis, we made the following experiments: We cut a large quantity of fresh cabbage in thin slices, dried them for about a week at 37° C., and divided them in two portions. Each of these pertions was placed in an open exsiccator, and each exsiccator in a separate incubator at precisely 37° C. We then filled the bottom of one of the exsiccators (but not of the other) with water, taking care to prevent any of the cabbage being immersed. Accordingly, in one of the incubators, but not in the other, the dried cabbage was continually exposed to an air saturated with moisture. After four weeks we began to feed some guinea-pigs with the moist and others with the dry cabbage in addition to oats. The result was, that the moist cabbage had lost most of its antiscorbutic properties, whilst the dry cabbage had retained them [7].

Having repeated this experiment with the same result, we imagined that the successive discrepancy in antiscorbutic effect of dry cabbage, mentioned above, may be due to some sort of hydrolysis of the antiscorbutic "vitamines," and that this loss may be prevented if the cabbage (1) is dried so effectively as to be deprived of all of its natural contents of water, and (2) is kept in a closed vessel in order to protect it against the moisture of the air.

In order to ascertain tbe correctness of tbis view we placed cabbage, dried for a week as mentioned, above concentrated sulphuric acid in a closed exsiccator at 37° C. After about twelve to fifteen months guinea-pigs were fed on it, each animal receiving daily 3 grm. dried cabbage in addition to oats and water *ad lib.* The result was, that the antiscorbutic effect was pronounced after about fifteen months, when the cabbage was given without previous soaking in water and boiling. On tbe other hand, when given after about twelve months, the loss of preventive properties was very distinct, when the cabbage was soaked, before feeding, in water for twelve hours and thereupon boiled for a half hour in ½ per cent. saline water [8].

As dried vegetables before being eaten have to be soaked in water and boiled, this experiment was not satisfactory from a practical point of view. Assuming that phosphorus pentoxide is a stronger drying remedy, we made the following experiment. Having dried a considerable quantity of cabbage for a week as mentioned above, and having mixed it thoroughly, we divided it into four portions, which were treated in the following ways:

(1) One portion was placed into closed exsiccators at 37° C. On the top of the cabbage of each exsiccator was placed a saucer with phosphorus pentoxide, the latter being renewed as soon as it was liquified; this ceased to be the case after a couple of weeks. Thereupon the cabbage was put into bottles, the air exhausted from the bottles and hermetically sealed by means of a blower. Before the evacuation we put into each of most of the bottles, but not into all of them, a glass tube with phosphorus pentoxide. Having kept both sorts of bottles for eighteen months at 37° C., we began to feed guinea-pigs, each animal receiving daily 3 grm. dried (equal to about 30 grm. fresh) cabbage, in addition to oats and water *ad lib.* Before feeding the vegetable was soaked for twelve hours in ordinary water and thereafter boiled for a half hour in ½ per cent. saline water. The result was that it showed very pronounced antiscorbutic properties (Tables 6 and 8). The same applies, after twenty-six months, to the cabbage in bottles with phosphorus pentoxide (Table 7: for this experiment, however, nothing was left of the contents of the bottles without pentoxide).

TABLES SHOWING RESULTS OF EXPERIMENTS.

Food	Death after the beginning of the experiment	Loss or increase in weight at the end of the experiment	Loose teeth and hæmorrhages (ribs and knees)	Scorbutic alterations of number, microscopically examined bones
TABLE 1 (6 animals).—Oats and water	24 to 30 days	− 37, 38, 39 and 57 per cent.	All scorbutic	13, 4 of 11, 12 of 17, 16 of 17, and 11 of 19 examined ribs; these were not examined in the 6th animal, which, however, had 2 scorbutic tibiæ and 1 scorbutic femur. (Of the 5 other animals 4 had corresponding alterations of both tibiæ, and 3 of both femora)
TABLE 2 (5 animals).—Oats, water, and 30 grm. fresh cabbage per day an animal, boiled for one hour in ½ per cent. saline water	71 and 91 days (4 animals, all killed)	− .8 per cent., − 2·5 per cent. (71 days), 0 and + 7 per cent.	No alterations except in one animal (71 days) where pronounced	10 of 20 (71 days), 1 of 21, 3 of 21, and 2 of 22 examined ribs; the second animal, but not the others, had also one scorbutic tibia. The 5th animal had no alterations (19 ribs, 2 tibiæ, and 2 femora examined)
TABLE 3 (3 animals).—Oats, water, and 30 grm. fresh carrots per day an animal, boiled for half an hour in ½ per cent. saline water	63, 76 and 97 days	− 20, 43 and 46 per cent.	All scorbutic	2 animals, no alterations (12 resp., 15 ribs, 2 tibiæ and 2 femora examined). In the 3rd animal (97 days) 3 of 15 ribs, 1 tibia and 1 femur were scorbutic
TABLE 4 (3 animals).—Oats, water and 30 grm. fresh cauliflower per day an animal, boiled for half an hour in ½ per cent. saline water	30, 43 and 46 days	− 20, 46 and 46 per cent.	All scorbutic	10 of 16, 3 of 16, and 10 of 15 examined ribs; in the 1st and 3rd animal also, 1 tibia
TABLE 5 (4 animals).—Oats, water and cabbage, dried for a week at 37°C. in an incubator, soaked in water for 12 hours, and boiled for half an hour in ½ per cent. saline water. Each animal received daily 3 grm. dried = about 30 fresh cabbages	96 days (all killed)	− 7 per cent., 0, + 1·5 per cent., and + 11 per cent.	No alterations	2 animals: no alterations (17 resp., 23 ribs, 2 tibiæ and 2 femora examined). In the 3rd animal 4 of 17 ribs (but none of 2 tibiæ and femora), in the 4th 3 of 23 ribs and one femur (but no tibia) were scorbutic
TABLE 6 (3 animals).—Oats, water and cabbage, dried as in Table 5, and afterwards in exsiccators with phosphorus pentoxide at 37°C. The cabbage was then kept at 37° for 18 months in evacuated bottles with phosphorus pentoxide, and fed as in Table 5	27 (pleuro-pericard. fibrin.), 71 (synechia pericard.) and 112 days (killed)	− 33 per cent. (71 days), + 15 per cent (27 days), and + 50 per cent. (112 days)	No alterations	No alterations (12 resp., 13 and 15 ribs, 2 tibiæ and 2 femora examined)
TABLE 7 (4 animals).—As in Table 6, but the cabbage had been kept for 26 months	85, 112 and 160 days; the latter animal was killed	− 24 (112 days), − 14 (85 days), and + 26 per cent. (160 days)	No alterations	No alterations (11 resp., 13 and 16 ribs, 2 tibiæ and 2 femora examined)
TABLE 8 (3 animals).—As in Table 7, but the cabbage had been kept for 18 months in evacuated bottles without phosphorus pentoxide	90, 101 and 107 days	− 12, 5 (101 days), − 16 and − 20 per cent. (107 days)	No alterations	No alterations (17, resp. 22 and 22 ribs, 2 tibiæ and 2 femora examined)
TABLE 9 (3 animals).—Oats, water and cabbage, dried for a week in an incubator, and then kept for 18 months at 37° in not-evacuated, closed vessels with calcium chloride	31, 31 and 35 days	− 18, − 32 and − 34 per cent.	All animals scorbutic	3 of 21, 4 of 22, and 5 of 13 ribs were scorbutic. In all animals also both tibiæ (but not the examined femora (2 animals) were affected
TABLE 10 (3 animals).—As in Table 9, but the cabbage had been kept for 18 months in an ice-cupboard at a temperature between + 4–10 at 12°C.	58, 70 and 72 days	− 9, 21 (58 days) and 43 per cent. (72 days)	No alterations except in one animal (58 days), where 1 hæmorrhagic rib	No alterations (13, resp. 19 and 20 ribs 2 tibiæ and 2 femora examined)
TABLE 11 (4 animals).—As in Table 10, but the cabbage had been kept for 26 months at +4°C. in the cave of a brewery	42, 64, 74 and 79 days	− 10, 14, 23 and 24 per cent.	Pronounced alterations except in the animal living for 42 days	2 of 20, 4 of 21, 6 of 15, and 15 of 21 rib as well as most of the examined tibiæ and femora were scorbutic

(2) A second portion, having been dried for a week in the incubator, but not treated with phosphorus pentoxide, was put into cylindrical corked glass vessels, which were not evacuated, but at the bottom of which was placed a thick layer of calcium chloride. Having kept this portion for eighteen months at 37° C. in the same incubator as the cabbage mentioned under (1), we began to feed animals in exactly the same way as in the earlier experiment. This portion scarcely exercised any anti-scorbutic influence (Table 9).

(3) A third portion was treated like the others, but the vessels were placed in an ice cupboard, where the temperature, according to the season, varied between 4° and 10° or 12° C. This cabbage, after eighteen months, exercised marked antiscorbutic influence, but not so great as the portion treated with phosphorus pentoxide and kept at 37° C. (Table 10).

(4) The fourth portion was kept in corked cylindrical glass vessels, without any drying remedies, at about + 4° C. in the cellar of a brewery. When soaked in water, &c., as in the other experiments, it exercised, after twenty-six months, a moderate antiscorbutic influence, being less than that of the third portion, but markedly better than that of the second (Table 11).

As we have had nobody to assist us, we regret not to have been able to apply the methods for measuring the antiscorbutic value worked out at the Lister Institute of London. Considering, however, the details of the accompanying tables, it is evident that cabbage, dried by means of phosphorus pentoxide, can be kept at tropical temperatures, and yet, after eighteen to twenty-six months and a soaking for twelve hours in ordinary water and a boiling for half an hour in ½ per cent. saline water, be possessed of very pronounced antiscorbutic properties. As shown in the tables, these properties are even much greater than those of fresh carrots and fresh cauliflower boiled for the same time. (Tables 3 and 4.)

We have not made any experiments with oats, water and fresh cabbage boiled for half an hour in ½ per cent. saline water; as for these nutriments, we must limit ourselves to give, in Table 2, the results of a previous experiment with boiling for one hour in such water. On the other hand, we have previously daily fed guinea-pigs on white bread, water and 30 grm. fresh cabbage per animal, boiled for half an hour in ½ per cent. saline water [9], the results being not markedly better than those obtained by drying by means of phosphorus pentoxide.

It may be added that the "sharp" drying by the pentoxide deprives the cabbage of some of its genuine taste. But it keeps much of it, and the many colleagues who have used it in their households have unanimously agreed with us, that it is a good and palatable nutriment, especially as "sour cabbage" (boiled with a little butter, vinegar and carvey seed) and as Irish stew. In these dishes, which are very common in Norway, the carvey seeds and pepper (Irish stew) hide the fact that the cabbage has lost some of its taste.

These results have therefore given us the hope to be able to preserve not only cabbage, but perhaps also other vegetables, in such quantities as will be necessary for provisions on board ships. This ought to be a considerable benefit to Norwegian sailors. It is true that they now very seldom suffer from manifest scurvy. But on the one hand they not seldom, on board sailing ships, pass two to three months without getting fresh provisions. And, on the other hand, the bones of guinea-pigs already show the specific alterations after a feeding on oats and water for ten days [10], that is a good time before the microscopic symptoms of the disease. Under these circumstances it is very probable that the lack of fresh provisions is, at least, able to produce weakness, which might be prevented by vegetables preserved without loss of much of their antiscorbutic properties. Supposing that they also keep much of their original taste and therefore are eaten with a similar appetite as when they are fresh, these vegetables might also be useful with respect to the prevention of ship beri-beri. The reason is that the polyneuritis gallinarum has been proved to be prevented by dried cabbage and other vegetables [11].

However, the phosphorus pentoxide method is too expensive and takes too much time for manufacturing purposes. We have, therefore, tried to obtain a corresponding result by depriving cabbage of its moisture by drying it for one to two days by means of an electric fan and thereupon for the same time by means of an air-pump. This process has, however, till now given unsatisfactory results. As regards the second to the fourth of the experiments mentioned above, their results will appear from the following:—

Summary.

(1) Thin slices of cabbage which are dried for one week in an incubator at 37° C., and thereupon at the same temperature by means of phosphorus pentoxide, show very pronounced antiscorbutic properties when kept at 37° C. for eighteen to twenty-six months in vacuum bottles.

(2) The same cabbage loses almost all of these properties when not treated with phosphorus pentoxide but kept for eighteen months at 37° C. in closed vessels with calcium chloride.

(3) If treated as under (2) the cabbage keeps its properties much better at + 4° to + 10° to 12° C.

(4) The results are better than mentioned under (2), but not so good as under (3), when the cabbage is kept at + 4° in closed vessels without any drying remedies.

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[11] Axel Holst, *Centralblatt f. Bakteriologie*, 1918; Shorte and Charubrata, Roy. Special Indian Science Congress, 1919, *Indian Journal of Medical Research*.

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NOVEMBER 1, 1920.

AN X-RAY MOTOR-AMBULANCE WAGON FOR USE AT HOME AND IN TROPICAL COUNTRIES.

THE X-ray wagons were found of considerable value in various seats of war. It is now a question whether they cannot also be used in peace upon a more extended scale and with even increased benefit to patient and doctor. In Britain there is a prospect of their value being widely tested, and the development is being watched with interest. The writer has been privileged to initiate the test in London and its neighbourhood. The idea of utilizing the X-ray motor-ambulance originated in a conversation between Major Robert Mitchell, C.B.E., of the Polytechnic, Regent Street, London; Dr. Robert Knox, the well-known X-ray authority, of 38, Harley Street, London; and the writer of this note. The furtherance of the idea was rendered possible by the acquisition of an X-ray motor-ambulance which was built by the British Red Cross Society for use in Italy, and now, being no longer required for war purposes, was available for civil work wherever required. Through the influence of Major Mitchell an introduction was obtained to the authorities of the Eccentric Club, Ryder Street, Piccadilly, London, and the writer was placed in touch with Mr. Montague Bates and Mr. Gerald Cripps of that Society. The work of the Eccentric Club during the war is well known; the hostel system in London for the sick and wounded soldiers was founded by the Society and is now a matter of history which will live as a model of practical philanthropy, economically but wisely and liberally conducted, and as a humanitarian work of supreme value.

To the members of a Club imbued with such feelings and instincts an appeal for help for such a scheme as that put before them by Major Mitchell and his colleagues found ready listeners and willing helpers. Their help was put into practical shape by a contribution in money sufficient to purchase the wagon; and the British Red Cross Society, at the instigation of Sir Arthur Stanley, K.C.M.G., the Chairman of the Executive Committee of the Society, presented the X-ray equipment. The Eccentric Club presented the wagon to the College of Ambulance, 56, Queen Anne Street, London, W., on the condition that it should be used whenever required in London or provinces.

No mean gift estimated in monetary value alone for these wagons have to be specially made for the work required of them, and the equipment is costly seeing that delicate and fragile apparatus has to be so made and protected as to be capable of being transmitted for long distances and over rough road it may be, so as to reach their destination. What is their destination? In other words, to what use are wagons of this kind to be put in times of peace? The story of their purpose may perhaps be best told as follows:—

When the writer was introduced by Mr. Cripps to Mr. Montague Bates at the Eccentric Club, he proceeded to give a short account of the purpose to which he proposed to put these wagons. They are none other than that, instead of bringing the injured or sick man to the X-ray apparatus, the apparatus would be brought to him. In place of the injured man being taken from his bed, placed on a stretcher, and conveyed by cab, motor-car, ambulance wagon or train, to where the X-ray picture can be taken, say, in hospital or the private rooms of the X-ray expert, and after the picture

is taken he has to travel back home again, the X-ray expert and his wagon shall proceed to the house and even the room of the patient and the picture taken there without the discomfort and pain involved in the movement, however carefully done. The wagon stands outside the house, the X-ray apparatus is carried into the house or bedroom, a cable (or lead) from the wagon to the house is taken by the door or through the bedroom window to the apparatus within. It resembles and reminds one of the vacuum cleaner brought to one's door with "the leads" passing by way of a window to the dust-removing machine within.

Mr. Montague Bates listened attentively to the story, and when it was told, he said: "I broke my leg in Cornwall. I was taken to London and occupied a room near the top of a house in Portland Place. I was taken from there upon a stretcher, carried down the narrow stairs from the top of the house and conveyed in a car to the house of the X-ray expert, lifted upon the table, and after the picture was taken had to travel back to my quarters in Portland Place. I shall never forget the agony I suffered by that journey, and in my hope that no one else shall ever be exposed to such torture, I promise you all the support I can give to this humanitarian movement, and although I cannot pledge you that the committee and members of the Eccentric will do so, I am of opinion from what I know of them that they will do likewise."

The result of this conversation is known to-day, for the Club has presented an X-ray wagon for public use, and it has already been used for that purpose by the College of Ambulance authorities.

Major Mitchell took the matter in hand, and by his personal exertions the procedure of transference was brought about.

After settling the X-ray motor-ambulance in its quarters a trial expedition was made to test its mobility and to get the bearers used to handling the contents. The occasion was an ambulance demonstration the writer was giving at Mr. Howard Carter's residence, Ardeley, Stevenage, Herts, 35 miles from London. A doctor from Hitchin, Herts, some 40 miles from London, saw the announcement in circulars issued in that part of Hertfordshire about the ambulance demonstration and brought a patient with an injured leg to be examined. Although the apparatus was only taken for demonstration and practice, yet we were able there and then to "screen" the leg successfully.

Dr. Gilbertson's letter given below best testifies to the appreciation with which the idea of an X-ray apparatus on wheels capable of being taken to any part of the country is regarded. Herewith Dr. Gilbertson's letter concerning the matter:—

"Baneroft,
"Hichin, Herts.
"*October* 12, 1920.

"Dear Sir James Cantlie.

"I saw from an announcement circulated in this part of Hertfordshire that at the Ambulance Demonstration by the College of Ambulance, London, you were giving at Ardeley Bury on October 9, 1920, you were bringing an X-ray mobile ambulance with you. I had a case in the heart of the country which required 'screening' or a photograph taken, and so availed myself of the opportunity and brought my patient over, who had injured his leg.

"I was proud to learn that I was the first to make use of this X-ray apparatus. The leg was successfully 'screened,' the injury showing quite plainly. I understand the scheme provides for an X-ray motor-ambulance to visit cases within 50 miles radius of London to be paid for when possible, and given free in cases which cannot afford to pay. As a country practitioner I feel a great responsibility will have been removed if such a splendid scheme can materialize, as in cases of bad fractures and other ailments, especially among the poorer classes, it is absolutely impossible to get the best results without an X-ray photograph.

"I feel sure the idea will find whole-hearted support in the rural districts, both from the medical profession and the public. May I congratulate the Eccentric Club on their foresight and generosity in providing such an up-to-date mobile X-ray wagon?

"Yours sincerely,
(Signed) "H. Marshall Gilbertson,
"M.R.C.S., L.R.C.P.London."

In an accompanying note Dr. Gilbertson states that the town of Hitchin, with a population of 14,000 people, has not an X-ray apparatus within its boundaries, and patients have to be sent 40 miles to London to have an X-ray picture done. If this is the case in some towns within 50 miles radius of London, how much more is a portable X-ray apparatus likely to be required in the country villages or farmhouses where an accident has occurred and movement would be dangerous or painful? The X-ray motor would be sent to the village or farm with an expert in X-ray work—a medical expert if possible—free of charge or at a modified charge when folks are poor, but those who are well-off pay for the privilege.

Any X-ray specialist—a medical man, of course—can obtain the use of the wagon and himself go to his better-off patients in the country and receive his fees as he would in towns, or will be able to charge at the rate of consultant medical fees when the patient is at a distance; in this way no practice is lost to the specialist and the motor X-ray expert will thus not be robbed of his just duties.

In hospitals where an X-ray apparatus is to hand it will not be necessary to obtain the wagon, but in private houses in London and in the country where it is dangerous to move the patient, as in fractures of the spine, &c., the College of Ambulance wagon is available at all times.

If in England this proceeding is necessary, how much more in parts of our Empire where the distances are great, where means of conveyance are limited and few and far between, the practical use of a wagon of this sort is at once apparent. Where roads are rough it will not hinder the wagon

getting along, nor will the apparatus be thereby injured. It is so carefully made that it can stand bumps and jolts with impunity, and the wagon at the College of Ambulance was intended for the rough hill roads in northern Italy, so it will stand almost any rugged road. Where no road exists, as in the interior of China and West Africa, the wagon with its contents could be conveyed by boat, or the apparatus could be removed from the wagon and conveyed by boat and hence by bearers to places beyond the river banks.

Several doctors from towns outside London have seen the writer about the scheme here unfolded, and they are already endeavouring to get X-ray motor-ambulances to serve districts in Scotland and England for a radius of 50 miles or more around centres where wagons of the kind may be housed. In this way a network of areas could be spread covering all parts of the country which could be served with the X-ray motor-ambulance to the benefit of the medical profession and the lessening of pain and suffering to the people.

JAMES CANTLIE.

Annotations.

Some Notes on Animal Diseases in Panama, with Special Reference to Blood and Muscle Parasites (Herbert C. Clark, M.D., *Proceedings of the Medical Association of the Isthmian Canal Zone*, vol. x, Part 2, July 1917 to December 1917.)—The first protozoal disease to be noted in Panama was murrina, a fatal trypanosomal disease of mules and horses, discovered by Darling in 1909. Anthrax was next noted in cattle and hogs. A further outbreak of disease among imported animals was investigated and was thought to be identical with bovine piroplasmosis or Texas cattle fever, but the parasite was not isolated.

The importation of large numbers of beef cattle (and other animals) by the Bureau of Animal Industry was followed by the real epidemic of anthrax disease on the Canal zone. The disease was soon controlled but continues to require close attention. Following this outbreak a great deal of illness was noticed among the imported cattle on Miraflores pasture, chiefly among calves of 6 to 10 months. An investigation was undertaken. The sick animals gave every evidence of suffering from piroplasmosis but the parasite could not be identified in the blood films. Two of the sick calves were then killed and examined while the cadavers were in a perfectly fresh condition—this had not previously been the case. A severe anæmia and some type of an acute infection were noted; and on the brain capillaries being examined *Babesia bigemina* was found to be present in large numbers. On the native cattle being examined it was found that practically all of these were carriers of the parasite, it being found with ease in the brain films, and in a few cases in the spleen and marrow. The dependence on blood films in the former investigations had caused the diagnosis to be missed as these were too scantily infected to reveal the presence of the parasite.

Relapsing Fever—Its Occurrence in Panama (Roland O'Connor. M.D., *Proceedings of the Medical Association of the Isthmian Canal Zone*, July, 1917 to to December, 1917, vol. ix, Part 2).—The relapsing fever seen in Panama is of a mild type with one to three relapses and no fatality. The infection is frequently mistaken at first for malaria. A blood examination will reveal the spirochæte, which is the true cause of the infection, *Spirochæte recurrentis* Obermeier 1873. Relapsing fever combined with malaria is frequently found, however; and it also very frequently exists with typhus, as was seen in the epidemic in Serbia in 1915. This gives additional support to the generally accepted theory that relapsing fever is a louse-carried disease, although it is possible that there is more than one carrier. As regards treatment, salvarsan and its substitutes are apparently specific for this affection.

Gastric Polyposis (*Papillomatosis*) (Ernest du Bray, *Archives of Internal Medicine*, vol. xxvi, August 15, 1920).—The author reports a case of gastric polyposis of the papillomatous type in which the clinical and Roentgen-ray diagnosis had been carcinoma of the stomach. Exploratory laparotomy revealed a broad based benign tumour situated in the greater curvature of the stomach. This tumour was excised and, following this, the patient had an uneventful convalesence, and six months later had had no recurrence of his former symptoms.

Tick Fever in East Persia. H. D. Wright and C. H. H. Harold (*Journ. Royal Army Medical Corps* September, 1920) investigated an outbreak of tick fever occurring in a company of Indian Pioneers stationed at Sharijabad, north of Turbat, in East Persia. The patients had been bitten whilst living in a serai, the healing scars of the bites being found on the ankles, wrists or neck. Several ticks of the species *Argas persicus* and *Ornithodorus lahorensi* were found in the bedding, and one of the ornithodorus ticks was seen to be gorged with blood. The total number of cases admitted into hospital was twenty-two, and spirochætes were eventually found in four cases. All the cases showed generally the same symptoms, namely, intermittent fever, with severe headache, frequently frontal, pain in the loins and down the backs of the limbs, a generalized pains all over the body. The majority had palpable spleens, and a few had a superadded bronchitic condition. The cases, however, showed great variability in their symptomatology, and were relatively resistant to salvarsan. In consequence of efficient and prompt treatment no case suffering from this disease died or was invalided from East Persia, but it would appear that casualties did occur among foreign civilians prior to the authors introduction of arsenical compounds.

Although tick fever in East Persia does not cause loss of life, it causes those suffering from it to remain in hospital for periods varying from twenty-three

seventy-seven days, and thus entails a considerable loss to the State, both in efficiency and money.

Emergency Measure and Foresight in Malaria Control (L. D. Fricks, *The Military Surgeon*, Aug., 1920.)—In addition to the ordinary measures for the prevention of malaria in mosquito-infected regions such as mosquito nets, drainage, oiling, screening, quinine prophylaxis, &c., Fricks recommends the method of hand-catching and destroying engorged anopheles which has proved to be effective and is worthy of careful consideration when confronted with an unusual emergency in malaria control round a recently established camp.

Delousing the American Army in France (H. L. Gilchrist, *The Military Surgeon*, August, 1920).—Although the work connected with the bathing and delousing of the troops of the American Expeditionary Force was done under the direction of the Quartermaster Corps it was actually carried out by the personnel of the Medical Department, under whom it should be placed.

In combating lousiness the first step is to teach the individual what lice are and to impress upon him the harm they can do. He should also be taught simple means by which they can be eliminated. The seriousness of lousiness should be realized by all officers in command of troops, and unremittant attention given by them in the examination of all members of their command, for without their personal supervision the work will not be accomplished. Along these lines the following should be closely followed: (*a*) the detention of men who are infested with lice; (*b*) the immediate disinfestation of all clothing and bedding belonging to the infested man; (*c*) the cleanliness of the man himself, bathing; (*d*) the cleanliness of his billet.

By allowing the men a share of the responsibility many ingenious contrivances were made by the soldiers, without which the delousing and bathing could not have been so successfully accomplished.

Types and Treatment of Pellagra (Stewart R Roberts, S.M., M.D., *Journal of the American Medical Association*, vol. lxxv, No. 1, July 3, 1920).—The author comments on the widespread distribution of pellegra in the United States, where it occurs in practically every State, and has caused probably 500,000 cases and 50,000 deaths in the last 20 years. The cases are now on the decreasc. He emphasizes the fact that pellagra is difficult of diagnosis where the cases do not present the typical eruption and urges medical practitioners to be continually on the look-out for it.

As regards etiology, Dr. Roberts considers we have got altogether beyond the theory of an unknown infectious agent, and the other theory that the cause is to be found in one food: corn; and affirms that Dr. Goldberger's researches and experiments, which are here recapitulated togother with twenty-five other cases given in detail, have proved that the disease can be caused by an improperly balanced diet and cured by a properly balanced diet which includes lean meat, eggs, milk, butter, and vegetables.

The Influence of Vitamines in the Course of Pellagra. (Voegtlin, Neill and Hunter, *Hyg. Lab. Bull.*, Washington, January, 1920.) The author has treated a number of cases of pellagra with extracts made from fresh ox liver, from yeast and from rice polishings. The dosage was based on the effects these preparations had in relieving the symptoms of polyneuritis in fowls. The cases treated with liver extract showed a rapid improvement, while no improvement whatever was obtained in those treated with yeast and rice polishings.

A Trypanosome associated with a Fatal Disease in the Carabao (*Philippine Journal of Science*, January, 1920).—F. G. Houghwont and S. Youngberg record a fatal case of trypanosomiasis in a male carabao which was inoculated simultaneously with virulent rinderpest blood and anti-rinderpest serum. They believe the organism to be a new species. It is one of the large trypanosomes, and bears most resemblance amongst the described trypanosomes to the "transvaliense" type of *Trypanosoma theileri*, which has not hitherto been recorded as occurring in the Philippine Islands.

Remote Manifestations of Focal Dental Infections with Case Reports (*Philippine Journal of Science*, January, 1920).—R. Fernandez points out that Sinclair Tonsey, in his preface to his monograph on "Roentgenographic Diagnosis of Dental Infection in Systemic Disease," mentions the observation on the wife of an eminent jurist who died as the result of an infection localized in the socket of a tooth, this focal infection being diagnosed rather late by means of X-ray. Fernandez quotes with approval the following passage from Tonsey: "The widest publicity should be given to the fact that greatly varying or sometimes serious or fatal systemic diseases and those affecting remote organs are often due to infection connected with the teeth or with the pneumatic sinuses of the face. The infected foci are discoverable by the X-rays. Some of these cases are cured by treatment of the oral lesion, and some require also autogenous vaccination with a bacterial culture from the pus in the oral lesion."

Fernandez's paper is, in fact, a commentary on this passage with illustrative cases.

A Case of Human Synophthalmia (*Philippine Journal of Science*, January, 1920).—S. de los Angeles and A. Villegas record and figure a male synopthalmia bilentica which was born of normal parents, who had had five previous children all normal. They consider it has no duplicate in literature differing from other recorded cases of cyclops with respect to the following characters: The apparent absence of the external nares (there being no proboscis to substitute them); the peculiar shape, size and position of the mouth; the location of the ears, and the shape of the face.

A Note on the Treatment of Surra in Camels by Intravenous Injections of Tartar Emetic (H. E. Cross, *Agricultural Research Institute, Pusa Bulletin*, No. 95, 1920).—The author tried the treatment on six camels in 1917. The camels were kept under observation from August 27th, 1917, to July 22nd, 1919. The treatment caused the trypanosomes to disappear from the blood. A 1 per cent. solution of the drug was used, the doses given varying from 60 c.c. to 600 c.c. Number of injections varied from three to ten.

The author considers that tartar emetic gives promising results in the treatment of surra, but is of the opinion that it should be tried on a large scale before being definitely considered a cure.

Current Literature.

THE INDIAN MEDICAL GAZETTE, Vol. LV, No. 8, August, 1920.

A Case of Melancholic Stupor (*Psychocoma*) (O. St. John Moses).—The patient, a Hindu male of 42, after an attack of melancholia in 1917, passed (in August, 1917) into a state of utter stupor, in which he remained for two and three-quarter years. During the whole of this time he lay on the flat of his back with his limbs flexed and quite rigid. All the muscles were of such an extraordinary stiffness that if he were lifted up by the occiput the entire head, neck, and body could be raised as if he were a block of wood. The eyes were wide open and fixed in a vacant stare, and be appeared quite unconscious of bis surroundings. He was carefully watched during the whole period, and was fed by means of a nasal tube. His recovery was as sudden as his illness; he awoke on the morning of April 9, 1920, as if from a long sleep, and from that time he steadily progressed towards complete recovery.

A Note on Vaccine Therapy in Typhoid and Paratyphoid Fever (C. J. Fox).—The author strongly advocates the use of typhoid vaccine as a curative treatment, having tried it in twelve cases with good results as regards eleven of these. He urges that the treatment should he tried on a large scale in a military or civil hospital, and considers that the question of carriers can be effectively dealt with by this means.

Note on a Case of Hydrophobia (S. Amritaraj).—The author gives an account of a fatal case of hydrophobia in a 10-year old boy which was only brought to his notice after violent symptoms had set in. He suggests that more Pasteur Institutes are needed, as natives will not make the long journey to obtain treatment. He also urges that there should he more stringent supervision regarding dogs.

Sodium Morrhuate and Sodium Hydnocarpate in Leprosy (P. Ganguli).—The use of sodium morrhuate and sodium hydnocarpate in five cases of leprosy of different types, by the autbor, has given most encouraging results. Botb drugs were used and botb appear to have a remarkable action on the maculo-anæsthetic type of leprosy. In two cases sodium hydnocarpate had to be substituted for sodium morrhuate, as the latter drug caused severe reactions. Mixed treatment with both drugs gave good results. It was noted that when sodium morrhuate failed to quickly reduce the nodules, sodium hydnocarpate succeeded. Sodium morrhuate appeared to he the more powerful drug in combating nervous lesions. As regards the dose, $\frac{1}{2}$ c.c. of the 3 per cent. solution was given, gradually increasing hy $\frac{1}{4}$ to $\frac{1}{2}$ c.c. weekly till the maximum of 5 c.c. was given in each dose. This dose was repeated weekly till a cure was effected. All the cases improved in every respect, and three were discharged as cured by a medical hoard.

Bacteriological Investigation of Normal and Diseased Eyes (Charu Chandra Sinba).—The author gives the results of the bacteriological examination of 100 native patients. In each case a smear was taken on a slide and a culture made on an agar slope. Sometimes a culture gives a negative result, while a film made from the same source shows some organisms. The microscopical examination of a stained film is generally sufficient for the clinical diagnosis of cases. Loffler methylene blue will be found a suitable stain for most cases. *Staphylococcus albus* was the chief organism found in cataract cases. Pneumococci and streptococci were also found in two cases. *Conjunctivitis* and *ophthalmia* cases showed gonococci, influenza bacilli, pneumococci, staphylococci and thick diplohacilli. *Trachoma* staphylococci and streptococci. *Blepharitis* staphylococci only. Lachrymal *obstruction and abscess*, staphylococci and pneumococci. Corneal ulcers showed chiefly staphylococci in mild cases, while those of a severe type are complicated with other organisms such as pneumococci and streptococci. Staphylococci were also found in normal healthy eyes.

Observations on the Treatment of Hookworm Disease (Babu Hira Lal.)—While investigating and treating a large number of cases of hookworm disease at Bhowra Colliery under the supervision of the Jharia Mines Board of Health with thymol (given in two doses, each containing 30 gr. of thymol with an equal quantity of sugar of milk, the interval hetween the doses being two hours), the author noted that eight of his cases that had previously suffered from night blindness were completely cured of this defect two or three days after the first administration of thymol. The author thinks there may possibly be some association between hookworm disease and night blindness, and that the latter complaint, which in some parts of India is extremely prevalent, may be found to he curable by thymol.

Organo-therapeutic Treatment of Malaria (H. J. Naronha).—Twelve hottles of a preparation called bazogen, purporting to consist of the extract of spleen, pancreas, thyroid and adrenal, were supplied to the author, who tried them on some cases of malignant malaria and malarial cachexia. The author con

siders that while the drug causes the temperature to drop, it has no special action on the parasite.

Hazaribagh : A Popular Health Resort (Ashutosh Roy).—A very complete account of this station is given with a view to bringing it to the knowledge of medical men in India as a health resort for patients needing a change of air.

Abstracts.

THE TREATMENT OF CHRONIC INDIGESTION IN CHILDHOOD.[1]

By John Lovett Morse, A.M., M.D.

Chronic indigestion in childhood may be divided into indigestion with intolerance for fat, indigestion with intolerance for sugar, indigestion with intolerance for starch, indigestion with intolerance for protein, and indigestion with fermentation. The borderline between simple indigestion with intolerance for one or more of the individual food elements and indigestion with fermentation is necessarily somewhat indistinct, because there is always fermentation going on normally in the intestinal contents. The line between normal fermentation, fermentation with simple indigestion, and indigestion with excessive fermentation must evidently be very indefinite.

Symptoms.

All types of chronic indigestion in childhood have certain general symptoms in common, such as loss of weight and other manifestations of disturbed nutrition. Among these are dryness of the skin and hair, cold extremities, pallor, irritability, peevishness and disturbed sleep. Other symptoms, which vary according to the type of indigestion, are diarrhœa and constipation and the alternation of diarrhœa and constipation. The abdomen may be distended, normal in size or sunken; there may or may not be vomiting; fever of varying degrees may or may not be present. None of these symptoms are however definite enough of themselves to justify a positive diagnosis as to the type of indigestion.

Diagnosis.

While something may be told from the condition of the bowels, the odour of the breath, the condition of the tongue, the presence or sense of gas, nausea and vomiting, and the history in general, the diagnosis must be made mainly, however, on the results of the examination of the stools, as the different types of indigestion have characteristic stools. The macroscopic examination of the stools is often sufficient to justify a positive diagnosis as to the type of indigestion present. It should never be depended on alone, however, but should be verified by a microscopic examination, because the microscopic examination will sometimes show that the conclusions drawn from the macroscopic examination were not justified. The microscopic examination of the stools should, therefore, always be made. This is not a difficult matter and requires but a few minutes.

A small portion of the stool is spread on a slide and stained with either Lugol's or Gram's solution. Starch granules stain blue or violet. Another portion is spread on a slide and stained with a saturated alcoholic solution of sudau III. The neutral fat drops and fatty acid crystals stain red. Soap crystals do not stain with sudan III. A drop of glacial acetic acid is then allowed to run under the cover glass. The specimen is then heated until it simmers. This changes the soap into fatty acids, which then stain. If it is desired to determine whether the fat is in the form of neutral fat or fatty acids, another specimen is stained with carbolfuchsin. This does not stain neutral fat, but stains fatty acids a brilliant red and soaps a dull red.

The bacteriologic examination of the stools is not usually necessary, but in certain cases is absolutely essential, as a positive diagnosis is impossible without it.

The Stools in Indigestion.

The stools vary decidedly in the different types of indigestion.

Fat Indigestion.—The stools are usually large, semi-solid, grey, *acid* in reaction, and often contain a considerable amount of mucus. They are sometimes dry, hard and grey or white. More often they are loose, frothy, grey and extremely acid. The odour is that of butyric acid, and they contain considerable amounts of mucus. Sometimes the fat is in the form of small, soft curds, or the stools appear oily, as in babies. Microscopically, the fat is present in various forms, rarely as neutral fat, more often as fatty acids or soap.

Sugar Indigestion.—The stools are loose, yellow, sometimes green, frothy and *acid* in reaction. The odour is that of acetic or lactic acid. The stools are very irritating to the skin, and often contain mucus. Microscopically, little abnormal is seen, except that sometimes, as the result of the diarrhœa, they show unabsorbed fat and undigested particles of food which have been hurried through the intestine.

Starch Indigestion.—The stools are loose, yellow-brown, sometimes green, often frothy, and *acid* in reaction. The odour is acid, usually being that of acetic or lactic acid, but sometimes, if there has been a change in the starch to fat, that of butyric acid. If very acid, the stools are irritating to the buttocks, but usually are not. They occasionally contain mucus, and almost invariably considerable amounts of starch, either unchanged or partially converted into dextrine.

Protein Indigestion.—The stools are loose, brownish and *alkaline* in reaction. The odour is foul or musty. They usually do not contain mucus.

Indigestion with Fermentation.—The characteristics of the stools are the same as in other types of indigestion, with the addition of those due to the fermentation. They are likely to be frothy and to

[1] Abstracted from the *Journal of the American Medical Association*, July 10, 1920.

contain more mucus. The acidity or alkalinity of the reaction is increased, according to the type of fermentation present and the odour is more acid or putrefactive.

Bacteriology.

In general the bacteriologic examination of the stools is not of great importance in diagnosis. Usually, no additional information is obtained from it. *The intestinal flora is, of course, either fermentative or putrefactive, that is, one which forms acids or alkalies from the intestinal contents.* The type of the intestinal flora can always be determined from the reaction of the stool. In the acid stool of carbohydrate indigestion, however, the presence or absence of organisms of the gas bacillus group is of considerable importance in indicating the form of treatment. The determination of the presence or absence of the gas bacillus by the fermentation test is not difficult, and can be carried out by any one in his office without special training. In protein indigestion there is an excess of putrefactive organisms. Porter and his coworkers have recently developed a method for the recognition of this type. It is very possible that organisms of the butyric acid group or *Bacillus acidophilus* may be of importance. There are, however, no easy methods for recognizing these organisms, and no specific treatment, if they are present.

Treatment.

There is no place for the so-called digestants in the treatment of chronic indigestion in childhood. There is probably never an insufficiency of either hydrochloric acid or pepsin and, as pancreatin is destroyed in the stomach, it cannot possibly be of any use. The general methods of treatment have already been mentioned. Further treatment, therefore consists primarily in regulation of the diet to fit the digestive capacity of the individual child. The element or elements of which it cannot take care must be cut down to the point where it can take care of them. This point can be determined only by the examination of the stools. The deficiency in calories, brought about by the cutting down of the amount of one or more of the food elements, must be made up by increasing the amount of the others. The amount of the element that is causing the trouble must be increased as fast as the increasing tolerance will allow. It is not enough in severe cases of chronic indigestion, due to intolerance of one or more of the food elements, to give general directions as to the diet.

The diet must be laid out explicitly, and the number of grammes of the offending food element allowable daily must be definitely stated. The number of calories which the child needs must also be indicated. A list showing the caloric value and the content in grains of the various food elements in the foods allowed must be given to the parents and its use explained. In my experience, almost all parents are intelligent enough to use these tables. I have had no difficulty in getting their interest and co-operation.

In the cases in which there are marked clinical evidences of fermentation, bacteria undoubtedly play an important part in the production of the symptoms. They unquestionably also play a part in the cases in which the evidences of fermentation are less marked, because bacterial fermentation is always going on in the contents of the gastro-intestinal tract under both normal and diseased conditions. What proportion of the symptoms in a given case is due to bacterial fermentation and what proportion to disturbance of the chemical processes of digestion is, however, almost impossible to determine. It is impossible, moreover, to know whether the trouble was originally due to bacteria or to disturbance of the chemical processes of digestion. In general, however, it is probable that the difficulty was not originally due to bacteria, as it is impossible to implant permanently any organisms in the intestines by giving them in the food. Fortunately, it is not important to know which is primary because the two factors are finally active in every case.

Whether primary or not, however, abnormal bacterial activity must be stopped. It is impossible permanently to change the intestinal bacterial flora by giving bacteria by the mouth, although the flora may be temporarily somewhat modified if the bacteria are given continuously. The intestinal flora can be changed by changing the composition of the food, that is, the flora may be changed from the *acidophilic* to the *putrefactive by changing the composition of the food, and vice versa.* Cutting down the proportion of the carbohydrates and increasing that of the protein in the food changes the flora from fermentative to putrefactive, and cutting down the proportion of protein and raising that of carbohydrates changes it from putrefactive to fermentative. This can be proved by bacteriologic examination of the stools, but is shown equally well by the change in the reaction of the stools, the stools *being acid when the bacterial flora is mainly fermentative, and alkaline when it is mainly putrefactive.*

Organisms growing on fat have relatively little to do with fermentation in the intestinal tract, but the products of their activity increase the acidity of the stools. Treatment by regulation of the diet on the indications furnished by the examination of the stools thus not only aids the weakened digestive powers but also changes the bacterial flora.

When the organisms of the gas bacillus group are the cause of the fermentation in the intestinal contents something may also be done to limit their activity by the administration of organisms that produce lactic acid. The best type for this purpose is probably *B. bulgaricus.* It is more effective when given in the form of buttermilk than in tablets or cultures, because it is numbers that count, and there are infinitely more organisms in buttermilk than in any tablets or little tubes of cultures. Furthermore, the buttermilk contains considerable amounts of lactic acid, which is of itself inimical to the growth of the gas bacillus and putrefactive organisms. The lactic acid forming organisms are also sometimes of benefit in the treatment of putrefactive conditions. It must be remembered, however, that the lactic acid organisms cannot change the bacterial flora permanently.

This can be done only by so changing the diet as to change the character of the culture medium in the intestine. It is doubtful whether the growth of other pathogenic organisms can be influenced by the administration of any other organisms in the food.

There is no place for drugs, except for the temporary relief of symptoms, in the treatment of chronic indigestion in childhood. Cure can be brought about only by regulation of the life and diet. In severe cases the most minute attention to every detail is absolutely essential. In these cases recovery is a matter of many months and often of years, while relapses are frequent. Recovery is, however, almost always possible, provided the treatment is careful enough and is kept up for a sufficiently long time.

RELAPSING FEVER IN EAST PERSIA.[1]

By Major C. T. H. H. Harold.

Description of the Disease.

Incubation period one to twelve days. The attack commences with the same symptoms as Indian relapsing fever, viz., rigor accompanied frequently by vomiting, intense headache and pains in the limbs. The headache is frontal and often causes photophobia, and this is very characteristic of the disease. In the case of the Indian variety of relapsing fever the temperature of the patient during the first attack usually remains at a fairly steady high level for five to six days, with possibly one slight fall about the third day. After this initial rise of temperature there is almost invariably an apyrexial period of eight to nine days before the first relapse occurs.

In this Persian type of relapsing fever the first attack of fever may last anything from one to five days, usually three days, and the temperature of the patient is rarely as steady as in the Indian variety, the chart showing a very swinging type of fever with remissions which may touch the normal line. Profuse sweating accompanies the fall of temperature. The first apyrexial period may be anything from one to five days, and is usually two days. The subsequent relapses rarely exceed forty-eight hours in duration, and may last twelve hours only. They take place at fairly frequent but irregular intervals, the periods of apyrexia getting longer as the disease progresses. The largest number of relapses noted by us were seven, and these occurred within a period of forty-two days. In all probability many more would have been recorded if the disease in all cases had not been cut short by the administration of neosalvarsan. During the course of the disease the patient becomes progressively weaker, anæmic, debilitated and wasted. Splenic and hepatic enlargement is usual. Between the relapses the patient feels well and is cheerful. Bronchitis and epistaxis were observed in two of the cases and jaundice in one case only.

The swinging irregular type of fever with short and irregular apyrexial periods and numerous relapses is diagnostic of the Persian variety, and in this it is comparable to African relapsing fever, which is also tick borne.

Description of Spirochæte.

In the majority of cases the number of spirochætes seen in any one blood film is much smaller than the Indian variety, and this is indicated by the number of examinations that had to be carried out before the discovery of the first spirochæte. Out of a total of nineteen cases, and after prolonged searches by several observers, spirochætes were only detected in eight cases. In fourteen of the cases, however, examinations of the blood did not take place until the first relapse, and observations were cut short after the third to fifth relapse by the administration of neosalvarsan, which the bad state of the health of the patient necessitated. The diagnosis of the cases in which spirochætes were not found was made on clinical grounds, and the reaction of the patients to neosalvarsan confirmed the diagnosis. The use of the thick drop method, using dilute Loeffler methylene blue as the stain which we now adopted, would have undoubtedly given better results. In one case only were spirochæte found in fairly considerable numbers, and in this respect the disease resembles African tick fever, in which it is stated the spirochætes found are few.

The spirochæte may be said to be longer, a little coarser than the Indian variety, and its spirals are more regular and deeper, the Indian spirochæte being less regular and possessing open flexures.

Its length without showing divisional characters averages eighteen to twenty-one microns and short forms are rarely seen. On one slide a spirochæte thirty-five microns in length was seen by me without any attempt at division being visible in the protoplasm. Figure of eight and loop forms are met with.

It might be noted that although in length this spirochæte is comparable with the African variety it may be differentiated from it by the fact that it possesses fairly regular and deep spirals, whereas the African type is stated to have open flexures. It does not show, however, the extremely regular spirals which *S. novyi* is said to possess.

The characters of this spirochæte have received the confirmation of Captain Fry, I.M.S., Captain Walker, R.A.M.C., and Captain Venugopal, I.M.S.

Geographical Distribution of Disease.

Accurate information is extremely difficult to obtain in Persia. It is apparently thought that the Mianch disease is more or less confined to Mianeh and district, but it is undoubtedly more widely spread. There is evidence to prove that it is known on the Tehran Meshed Road and on the Eastern side we have the tales of "strangers' disease," tick bite fever, and Amrani fever. Amrani being an extremely filthy village in which *Argas persicus* is extremely common.

All definite cases of this disease admitted to our hospitals have come from the lines of communication

[1] From the *Journal of the Royal Army Medical Corps*, No. 6, June, 1920, vol. xxxiv.

above Kain and always from down-coming convoys. In up-going convoys Indian relapsing fever has only been found. All this points to this disease being endemic in the upper sections of the lines of communication above Kain and we have definite evidence from the Consular authorities at Meshed of infection of Kafir Kalah and Khaimi and the infection of Moore's convoy implicates Jainuk. It is possible that practically all old sarais built of hurnt brick are more or less infected.

All cases of relapsing fever admitted to hospital below Kain with one possible exception have been of the Indian variety and undouhtedly without exception louse borne.

In Meshed and also in Transcaspia during the winter of 1918—1919 cases of Indian relapsing fever occurred among the Indian troops. These troops were frequently lousy and the spread of this disease was probably by means of Indian carriers and lice.

It was not until the warmer weather when ticks became more active and convoy duties due to the Afghan War brought our troops more frequently in contact with sarais that this endemic disease of Mianeh or relapsing fever of Persia showed itself.

NOTE ON A SPECIFIC COMPLEMENT-FIXATION TEST FOR BILHARZIASIS.[1]

By W. A. Murray, M.B., Ch.B.

Technique Employed.

The technique followed was based on a modification of the original Wassermann test as outlined by Taylor (vide *Lancet*, January 5, 1918) and the results have been so satisfactory that, although the number actually performed has been small, it was thought well to publish a preliminary note on these, in order to stimulate similar investigations elsewhere in South Africa.

Antigen.—A very satisfactory antigen has been obtained from the livers of snails (*Physopsis africana*) infected with the cercariæ of *Schistosoma hæmatobium*. These have been supplied by Dr. Cawston who finds that 30 per cent. of snails in the pools around Mayville and Sydenham (Durban) are thus infected. The livers are ground up in alcohol (1 grm. liver substance to 10 c.c. alcohol); the mixture is kept at room temperature for five days with frequent shaking, is then filtered, and the alcohol extract used as antigen. For the test the antigen is mixed with 1 per cent. cholesterin (3—2), and is then titrated. The three antigens used so far have each given an anticomplementary titre of 1—3, and an antigen titre of 1—80. A dilution of 1—8 is used in the actual test.

An attempt was made with whole snails (infected) used in the same way as the livers described above, but with poor results. As soon as available, an infected guinea-pig's liver will be tried as antigen material, and if this is found satisfactory it will solve the present difficulty experienced in obtaining material for antigen.

The amboceptor, complement, and sheep cells are used exactly as in the Wassermann test.

Patient's Serum. — These are supplied by Dr. Cawston before commencing treatment with tartar emetic. At first each serum was inactivated at once and tested within twenty-four hours of having been drawn, as Fairley found that the results after twenty-four hours were not so reliable. I have, however, found no diminution in complement-fixing power for several weeks if the sera are kept on ice. Control sera were taken from various individuals who had never had bilharzia disease, and these have proved uniformly negative. Further the sera of syphilitic patients who do not suffer from bilharzia were also negative. The reaction is, therefore, a specific one. There has as yet been no opportunity of re-examining the blood of these bilharzial patients after they have undergone a curative course of treatment, lasting three to four weeks. It is proposed, however, to do this, commencing a month after cessation of treatment, and repeating the test at regular intervals whenever possible, in order to determine how soon a negative reaction may be obtained.

[1] *South African Medical Record*, May 8, 1920.

Correspondence.

To the Editor of the Journal of Tropical Medicine and Hygiene.

September 24, 1920.

Dear Sir,—We have read with very much interest the article contained in your valuable Journal of Tropical Medicine and Hygiene for July 15 by Dr. F. G. Cawston, upon the employment of oscol stibium in the treatment of bilharzia with so much success. We have received a letter from him which is practically confirmatory of what he has written in the article, and further he suggests that there is a wider employment for this oscol stibium in the treatment of what is known in South Africa as nagana disease among cattle. The chief veterinary officer at Nairobi has had very good results, upon his suggestion, and he also states in his letter that there are opportunities that might be taken of treating cases of bilharzia in human beings, extremely poor persons, who are unable to pay the fees. We would like to say that if you indicate the same through your valuable Journal, we are quite willing to send a reasonable supply of this oscol, free of charge, to any medical practitioner who is treating such cases, so that he may be able to use it without consideration of expense, and we trust with great advantage to the patients, as they are poor and are unable to pay for treatment. We feel certain that you will fall in with these ideas.

Thanking you in anticipation of your consideration,

Yours faithfully,

Oppenheimer, Son and Co., Ltd.

Original Communications.

NOTES ON AN OUTBREAK OF ASIATIC CHOLERA IN SYRIAM MUNICIPALITY, BURMA, IN JUNE-JULY, 1920.

By J. C. Tull, M.D., M.R.C.P.Lond.

Civil Surgeon, Syriam.

During the latter half of June and the first days of July, 1920, there was a sudden outbreak of Asiatic cholera in the Bogyok Works of Messrs. the Burma Oil Company, Limited. These works consist of a petroleum refinery, in which about 1,100 natives are employed, of whom some 500 are housed in the lines of the refinery. The housing accommodation consisted of two long huts, with galvanized iron sides and roofs, and a cement floor and verandah. The huts were subdivided into a varying number of compartments, to suit the wishes of various castes and races accommodated. The inhabitants consisted of Chinamen and Indians, the latter being of the Hindu, Choringhee and Uriya castes. Between the two huts were situated cook-houses, latrines (pails emptied twice daily), and a large water tank, served from an artesian well about 800 yards away, the well being about 800 ft. deep. Unfortunately the cook-house and latrines were only about 10 ft. apart. This is important, for to this unfortunate occurrence I believe the outbreak to be due.

The native has never been persuaded to keep his cook-house clean. He insists on spilling cooked-rice, remnants of curry, water in which rice has been boiled, &c., anywhere but into the receptacles provided for the refuse. He will not keep covers on receptacles, and if you give him a cemented area, with running water, specially for his ablutions, he is sure to use this as the most desirable spot in which to throw his refuse.

Suddenly on June 19 in these lines, where there were between three and four hundred coolies, with several cook-houses and latrines in close proximity, and where, unfortunately, a perfect plague of flies had developed in the early part of June, when the rainy season began, a case of Asiatic cholera was found. Nothing seemed lacking to make the outbreak serious. Flies abounded; coolies would not be sanitary; cook-houses and latrines were far too close to each other; and the native regarded the disease as being sent from the gods, and no efforts should be made to check it.

The one bright spot was that the disease was in the lines of a company who are always anxious to do the best for its employees. The Assistant General Manager, A. C. Lochhead, Esq.; the local Manager, A. Sharp, Esq.; and the Chief Engineer at Bogyok, R. Cloudsley, Esq., came to my assistance nobly, and gave me all necessary moral and financial support.

Methods adopted in handling the Outbreak.

(1) The Isolation Department of the Municipal Hospital, Syriam, was given over for the treatment of the victims. Orders were issued that all men falling ill with diarrhœa were to be immediately removed, with their clothes, to this hospital, where Sub-Assistant Surgeon, H. J. Andy, and a staff of menials were placed on duty.

(2) All coolies were confined within their lines, which were policed. Their supplies of food were bought for them in the local bazaar in bulk, brought to the lines, and issued as required.

(3) The source of the infection was sought for. The first victim had been resident in the lines for more than a month, had had no illness, and had not, as far as could be ascertained, been in any area known to be infected.

(4) The water supply was beyond suspicion. It came from an artesian well, and had it been guilty, many more victims must simultaneously have been attacked. Similarly, the general food supply was ruled out as the source of infection.

(5) The presence of a plague of flies made it very likely that they were the medium of infection. I was, however, unable to detect the comma bacillus in any flies. I believe there was a "cholera carrier," with the house-fly as the medium of conveying the disease. Supposing the flies to be the danger, our efforts were directed to getting rid of them. Of course, the natives would give us no help. With a sanitary staff we sprayed all cook-houses, latrines, and sleeping quarters and surroundings every few hours with formalin; washed the same area with cyllin twice daily; spread fly-papers everywhere; and (what was most effectual eventually) we adopted the American "fly-swatter," with which we killed flies by the thousand. But never a fly would a coolie kill!

The first case developed on June 19. Next day there was another case. On June 21 there were three new cases; June 22, six new cases; June 23, one new case; June 24, no new cases; June 25, six new cases.

It was therefore obvious that, in spite of our efforts, the outbreak was not being controlled. We therefore decided to build temporary lines, well removed from the infected lines, and move all non-infected persons from the old lines to these new temporary ones. The construction of these new lines was of bamboo matting, and the latrines of the deep-trench variety. Burnt paddy husk was used to cover the trenches as they were used.

While these temporary lines were being built, on June 26 there were two new cases; June 27, three new cases; June 28, nine new cases; June 29, three new cases; June 30, four new cases.

On July 1 we began to move the non-infected persons to their new quarters. Each coolie was made to take a bath; his entire kit (not very elaborate usually) was fumigated, and the whole lot were led literally, in squads of fifteen to twenty, to their new home, every effort being made to avoid transporting flies.

On July 1 there were no new cases; July 2, one new case; July 3, one new case; and July 4, one new case. On this day we finally had all non-

infected persons in their new quarters, free from flies, and from this date we had no new cases.

An interesting feature was the fact that of a dozen Chinamen whose quarters were sandwiched between two of the worst parts of the infected area not one developed cholera. The explanation was that the Chinamen kept their quarters scrupulously clean and killed the flies.

The victims were treated according to the method developed by Sir Leonard Rogers. Forty-one cases arrived in the hospital alive, and of these twenty-one subsequently died. One case lived only one hour after admission. All were of a severe type, with severe muscular cramps and early collapse.

The saddest incident of all was that the matron of the hospital, in her untiring devotion to the care of victims, developed the disease. She recovered, however, with no complications.

Such is the story of an outbreak, which promised at the beginning to be very serious. The lesson to be learned from it, I believe, is the one so often taught and so seldom heeded: destroy the house-fly by every means in your power.

SOME INFECTIONS DUE TO FRESHWATER SNAILS AND THEIR ERADICATION.[1]

By F. G. Cawston, M.D.Cantab.

The survival-time of the cercariæ which are continually escaping from certain species of freshwater snails is a very short one. Cercariæ do not usually live longer than the day on which they commence their free aquatic existence.

Members of that group to which the bilharzias belong can prolong their existence only by entering the blood-stream of some warm-blooded animal. Once they have gained an entry they never leave the blood-stream, and often live as long as their host.

Several distinct parasites which closely resemble the cercaria of *Schistosomum hæmatobium* infest freshwater snails in South Africa. *Physopsis africana*, a common snail of stagnant pools, is heavily infested with them. I have found them in 552 out of 1,896 specimens of this snail which I have collected from Sydenham and Mayville. Many are the typical cercaria which produces bilharzia disease, and by feeding a number of guinea-pigs on green food containing them, I have obtained the adult parasitic worm, *S. hæmatobium*. Others are almost twice the size of the bilharzia, measuring as much as 7 mm. in total length. These have developed into the typical bilharzia worm of cattle, *S. bovis*.

In July I obtained a physopsis from the Umhlangana river that was only 12 mm. in length, and yet was infested with mature bilharzia cercariæ. By artificial means I have produced similar infection in specimens of this common freshwater snail that were even smaller than this. I have also collected infested specimens from the Umbilo as high up as Sarnia, from the Pinetown stream which flows into the Umbilo, from tributaries of the Umhlatazana at Bellair, the Umsindusi at Maritzburg, the Umhlangana at Avoca, the Umhlanga at Ottawa, and various other parts of the Transvaal. Physopsis from these localities harbours the bilharzia parasite at all seasons of the year.

P. africana from the Umbilo, the Umgeni, and the Umhlangana is infested with a somewhat narrower and longer cercaria which may be an avian trematode. Its oral sucker is provided with boring processes somewhat stouter than those of the bilharzia. Some of these cercariæ are as much as 0·875 mm. in total length; the prongs of their divided tail being as long as the tail itself. They may be identical with the cercaria which infests physopsis at Maritzburg which I have described as *Cercaria secobii*.

Dr. Annie Porter has reported bilharzia infection in *Limnæa natalensis*, which may be looked upon as our commonest freshwater snail. This infestation is rare; but *L. natalensis* which I have collected from the Umgeni river harbours a redia-produced cercaria, somewhat resembling the bilharzia, but possessing longer prongs to its divided tail.

Recently I have found cercariæ resembling the bilharzia in *Isidora tropica* from Mayville, but I have not yet secured their adult forms. Infested snails will remain alive for several months and produce free swimming cercariæ all the while. Dr. Annie Porter has found over 1,000 distinct parasites in one infested physopsis.

There is another cercaria, not unlike the bilharzia, but possessing prongs having the resemblance of drawn-swords, which infests *I. schackoi jickeli* at Potchefstroom. Unlike the bilharzia, it is redia-produced, and may be a parasite of the water-rat, otter, or other water animal. It has been described by Dr. E. C. Faust as *C. gladii*.

Dr. E. C. Faust has reported the larvæ of *Schistosoma mansoni* in some of the material I sent him. This parasite may have been introduced into the Durban suburbs by soldiers returning from Egypt; but, until the larvæ of *S. bovis* is defined with certainty or the adult stages of *S. mansoni* obtained in Natal, the statement must be taken with caution.

L. natalensis at Lake Chrissie in the Transvaal and in the Durban suburbs is infested with other cercariæ which may be a danger to man and certainly attack animals. One of these, *C. pigmentosa*, develops into *Fasciola gigantica*, which has been found in the liver of man, and commonly occurs in that of oxen. Other specimens are infested with cercariæ closely allied to *C. pigmentosa*, which may prove to be *Distomum hepaticum*, the more common liver-fluke which has been found associated with liver-abscess in man.

The presence of these varieties of cercariæ shows the importance of securing their adult forms by experimental means. A cercaria somewhat resembling *S. japonicum* is reported from Calcutta, where

[1] Paper read at the South African Medical Congress, Durban, October 8, 1920.

the adult parasite has not been found. Dr. W. A. Murray has recently shown that the blood of a patient of mine who harbours this parasite from China gives a positive reaction to the antigen test prepared from our infested *P. africana*.

Eradication of the Cercariæ from Pools.

To a certain extent all fish may help to keep water clear of cercariæ, but I have recently shown that the small fish called "MILLIONS" are particularly valuable in this respect. I have watched them feeding greedily on bilharzia parasites, and, by keeping them under observation for several weeks, have shown that they are incapable of carrying the infection themselves or of passing the infection on to others, once the parasites have been digested along with other food. I have also watched them ridding a collection of water from the free-swimming cercariæ of liver-fluke. These valuable allies in eradicating bilharzia infection from pools should certainly be used more extensively in the infected areas of Natal and the Transvaal. They may be obtained direct from the fish factory at Stellenbosch.

As the life of a cercaria outside the body is so short, any collection of water that is free from snails soon becomes free from infection; but, although no snails may be found in a river, the river-water may be heavily infested with cercariæ which have been washed down-stream from snails remaining in its tributaries.

A very efficient means of destroying cercariæ in water is by adding COMMON SALT to it, and this is probably the best way of freeing green food, particularly watercress, from cercariæ. Lime is also useful in destroying cercariæ, but probably no better than strong solutions of salt. Sir Ronald Ross's LARVICIDE will quickly destroy all bilharzia cercariæ and allied organisms from collections of water; it would also destroy a large proportion of the snails. The average mixture is about 300 gallons of crude carbolic acid, 200 lb. of resin, and 30 lb. of caustic soda. One part of the mixture placed in 5,000 parts of water containing mosquito larvæ will kill them all in less than five minutes.

Eradication of Freshwater Snails from Collections of Water.

In supplying BIRDS with freshwater snails as food, Nature has provided that they should not exterminate the species, however greedily they feed on individual snails. In visiting a pool in search of food, wild birds carry in the mud attached to their claws numbers of minute snails and snails' eggs; thus, when devouring all the mature snails they can find along the banks of a river, they unconsciously introduce numbers of smaller snails to take the place of those they have eaten. In this way wild birds of all kinds are of little use in destroying freshwater snails, and I usually find the home of wild duck a useful place to search for new species of freshwater snails.

On the other hand, DOMESTICATED DUCK clear pools of freshwater snails without introducing new specimens. The pools on the Natal estates at Mount Edgecombe are remarkably free from freshwater snails on account of the presence of domesticated duck. A pool at the Natal Poultry Exchange is also free from them, whilst the neighbouring pool at the cable-station which harbours wild fowl contains numerous snails infested with cercariæ.

Sydenham Pools.

The value of domesticated duck in ridding collections of water from freshwater snails and thus eradicating the infection they produce is well brought out by my recent experience at Sydenham. These pools swarm with *P. africana* and *L. natalensis*, a very large proportion of the mature specimens being heavily infested with the bilharzia parasites or with cercariæ resembling those of the liver-fluke. During the last few weeks I found cercariæ and rediæ resembling fasciola infestation in six out of ten limnææ from these pools, and bilharzia parasites from these pools, and bilharzia parasites in seven out of eight physopses. One physopsis harboured leptocercariæ besides the bilharzia.

One of these pools is so infested with these freshwater snails that I have often collected over 200 in it at one visit. On August 28 I could find only one *ancylus* there and some snail's eggs on a water-lily leaf. Just a month before the Indian who owns the pool had taken my advice and introduced three white duck; these were swimming there when I arrived in search of snails. To show that the absence of snails was not due to climate changes, I visited a smaller pool within three minutes' walk which was fenced in and contained no duck. Here I found numerous *L. natalensis* and *P. africana*, one of the latter being 20 mm. in length.

The Department of Public Health might well reconsider the desirability of introducing domesticated duck into suitable places known to harbour freshwater snails in any quantity. The duck might be given free to the foremen at railway stations situated close to dams. This course is particularly indicated wherever dams have been erected along the course of rivers. Such dams often prove excellent hunting-grounds for snails and other evidences of stream-pollution. Legislation might even be introduced to protect these natural enemies of the freshwater snail, as the swan is protected on the London Thames.

Besides the fish and the birds which help to keep a river clean, occasional floods assist in washing away the pollution of rivers; but, in many low-lying districts, and amongst the sugar-cane especially, these floods often tend to increase the number of stagnant pools containing infested snails.

The majority of freshwater snails die when the pools become dry; but *Melania tuberculata*, which is very abundant in the experimental watercress beds at Prospect Hall, and is closely related to the intermediary host for *S. japonicum*, is provided with an operculum or lid which enables it to resist drying for close on three months. I have found a monostome and a styletted cercaria in this species of snail in Natal.

Lime has been shown to definitely help in keeping down the number of snails on a fluke-infested farm, and a farmer in Victoria has had some good results in this respect from using a bag of lime to every 1,000 cubic yards of water.

Of primary importance is the constant removal of rushes and floating sugar-cane from the rivers. Water weeds and water-lilies should be removed as far as possible and special attention paid to all dams.

Sources of the Rivers.

So long as infested snails are found close to the source of a river, efforts to cleanse the river lower down-stream will be unavailing. In view of the fact that some of the largest missionary institutions are situated close to the source of the Umhloti, Umhlatazana, Umgeni and the Umlaas, all pupils known to harbour the bilharzia parasite should undergo the curative treatment or be removed to the coast in the interests of both the European and the native population lower down-stream. The Educational Department might well give this aspect of disease prevention their very serious consideration; whilst the Provincial Administration might see their way to follow the commendable procedure of the South African railways, which pays half the cost of treatment of the members of the Railway Sick Fund suffering from bilharzia infection and undergoing treatment by a specialist.

Treatment of Bilharzia Carriers.

In view of the number of native and Indian patients harbouring the bilharzia parasite and continually spreading the infection, some means will have to be devised to afford free treatment in outlying districts. This would have a very decided effect in eradicating the disease and lessening the number of infested snails. Following the procedure of the suggested travelling hospitals in Egypt, a temporary hospital might be improvised at Stanger, Tongaat, or Sea View, where the treatment of large numbers of patients could be undertaken for a complete month. The Indian Immigration Board would be sure to render every assistance, and the affected sugar farmers would probably be willing to share in the cost. With several recent schemes for providing free medical attention to venereal patients in South Africa, some such means of rendering the poorer-class patients free from bilharzia infection might well be considered with the view of the necessary action being taken.

Effect of Therapeutic Doses of Mercury on the Kidneys and the Duration of its Excretion (L. G. Beinhauer, *American Journal of the Medical Sciences*, June, 1920).—According to the author's researches the excretion of calomel given in ordinary therapeutic doses begins within six to twelve hours, and is continued until the sixth day. In so far as can be determined by the urine analysis the drug is excreted without bad effects upon the kidneys.

Notices.

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THE JOURNAL OF

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November 15, 1920.

THE LONDON SCHOOL OF TROPICAL MEDICINE.

Opening the New Premises of the School.

It is one-and-twenty years—October, 1899, to be precise—since the London School of Tropical Medicine opened its doors to students wishing to obtain instruction in tropical diseases to fit them for the practice

of their profession in warm climates. The opening ceremony was an address by Dr. Patrick Manson (now Sir Patrick Manson, G.C.M.G., M.D., LL.D., F.R.S.[1] Founded at the instigation of Mr. Joseph Chamberlain, then Secretary of State for the Colonies, and with the support and under the direction of Sir Patrick Manson, at that time medical adviser to the Colonial Office, the School has flourished to an amazing degree and proved its importance and usefulness in a manner so convincing that it has received unstinted support in every corner of the Empire. The idea of the formation of a school of the kind was taken up heartily by the authorities of the Seamen's Hospital, Greenwich; and the Committee of the Hospital granted a space for building the School beside the Branch Hospital at the Royal Albert Docks, Poplar, London, E. To the chairman of the Seamen's Hospital Committee, Mr. Perceval Nairne (now Sir Perceval Nairne), to the Secretary to the Hospital, Mr. P. Michelli (now Mr. P. Micbelli, C.M.G.) and the members of the Committee of the Hospital, the Empire owes a deep debt of gratitude for their sympathy, financial direction and support, and their unfailing interest and devotion to the maintenance and advancement of the school at all times and on all occasions. The growth of the school is now a matter of history, and its usefulness is demonstrated by the multitude of medical men practising their profession in every region of the Empire.

For many reasons it was found advisable to remove the School from the Albert Docks, and it was finally settled to establish it at Endsleigh Gardens, Euston, London. A Hospital for Tropical Diseases is also part and parcel of the School: a most valuable addition, for not only will the instruction be theoretical and practical but clinical as well. The buildings are ample, the laboratories, lecture rooms, museum and the special department being convenient and capable of accommodating the many departments which are now necessary for the teaching of tropical medicine and for research. The Bureau of Tropical Literature is now established in the School premises under the able direction of Dr. Bagshawe. On November 11, 1920, H.R.H. the Duke of York formally opened the new premises of the School in Endsleigh Gardens, Euston Road, London.

His Royal Highness was received by Viscount Milner (Secretary of State for the Colonies), the Marquess of Milford Haven (President of the Seamen's Hospital Society), Sir Patrick Manson (founder of the School), representing the teachers and honorary medical staff, and Surgeon-General Sir Havelock Charles (Dean of the School). Among others present were Mr. Austen Chamberlain (Chancellor of the Exchequer), Sir William and Lady Leishman, Lady Maude, Lady Manson, Sir Edward Hope, Captain Sir Acton Blake, Sir William Bennett, Major-General the Hon. Sir Reginald Talbot, Sir Perceval Nairne (Chairman of the Committee of Management), Sir Arthur Clarke (Deputy Chairman), Admiral of the Fleet Sir Henry Jackson, Sir Herbert Read, Sir John Rose Bradford, Professor Alcock, Mr. Michelli, Miss Knight, Dr. Andrew Balfour, Mrs. Chalmers, Professor Hewlett and Mrs. Hewlett, Colonel J. J. Pratt, Colonel R. H. Elliot, Professor Leiper, Dr. and Mrs. Sambon, Professor Simpson, Dr. Low, Dr. and Mrs. Manson-Bahr, Dr. Bagshawe, Dr. Wenyon, Dr. Castellani, Dr. J. G. Thomson, Miss Wheeler, Sir James Cantlie, &c.

Lord Milner, having presented the members of the committee of management, the medical staff, and the teachers of the School to the Duke, described the beneficent work of the Hospital and School in connection with the Seamen's Hospital Society at Poplar, and in conjunction with a similar institution at Liverpool. As extensions became necessary the requisite financial support had always been forthcoming, and when they moved to the present premises, and it became desirable to bring with them also the Seamen's Hospital, the British Red Cross Society and the Order of St. John gave them the munificent donation of £100,000. Since then it had been found necessary to raise for working expenses an additional sum of £50,000, of which he was glad to say they had been able to obtain £20,000, thanks to the energetic work of the Committee of Management. With the support and patronage of the Duke of York be had no doubt that they would be able to get the whole of the sum required.

H.R.H. the Duke of York, having unveiled a tablet recording the gift of the £100,000 by the Red Cross Society and the Order of St. John, said: "I have great pleasure in declaring this building open for the purposes of a School of Tropical Medicine and a Hospital for the cure and treatment of persons suffering from tropical diseases. In doing so, I cannot too strongly commend the work that is being done in the interests of those who have helped to build up the great tropical dependencies of the Empire. We stand under a great debt of gratitude to all those who have aided in bringing to such a successful issue an undertaking so beneficial not only to those scientific men who have devoted their lives to the cause but to those who have contributed and assisted in raising the necessary funds. To the successive Secretaries of State for the Colonies we owe much; and now we have the able assistance of Lord Milner, the present Secretary of State. We also record our gratitude to the British Red Cross Society and the Order of St. John of Jerusalem.

"To the students who are beginning the forthcoming session—many of whom, I understand, are officers who have been appointed to the Medical Department of the Colonies and India—I wish every success in their vital and interesting studies. There is no need for me to emphasize to them the importance of their Imperial task. It is the first duty of a civilized community to provide the conditions of a healthy life, to sweep away the plague spots, and to take measures against infection, and possibly most important of all, to instruct the public as to the habits of life which make for health.

"The School of Tropical Medicine holds a watching brief for the health of the outposts of our wide Empire, and it is here that schemes may be initiated such as have made what was once known as the 'White Man's Grave' a land where to-day work and effort may be

[1] As a matter of history it is of interest to note that Sir Patrick Manson's address was delivered by Mr. James Cantlie.

advanced without the toll of death and suffering which formerly attended life in those regions. I venture to hope that still further funds may be forthcoming to carry on this great work, and especially to advance research."

His Royal Highness afterwards occupied an hour in inspecting the Hospital and unveiled a tablet in the Stanley Maude Ward recording that it was endowed by the Mesopotamia Comforts Fund in memory of the late Lieutenant-General Sir Stanley Maude and the officers, non-commissioned officers, and men who gave their lives for their country in Mesopotamia during the war.

The Duke of York said: "I deem it an honourable and grateful duty and privilege to unveil this tablet to the memory of that distinguished soldier, General Sir Stanley Maude, who on the eve of the successful completion of his great military operations in Mesopotamia was stricken with and died from a virulent tropical disease to the grief and loss of his country. In doing so I have to thank the Committee of the Mesopotamia Fund for the endowment which they have created to provide hospital accommodation and highly skilled treatment for sufferers from tropical diseases.".

Review.

HANDBOOK FOR TUBERCULOSIS WORKERS. By Noel Bardswell, M.V.O., M.D., F.R.C.P., Principal Assistant Medical Officer, Public Health Department, London County Council. London: John Bale, Sons and Danielsson, Ltd., Oxford House, Gt. Titchfield St., Oxford St., W. 1920. Pp. 66. Price 1s. 6d. net.

This handbook has made a timely appearance, for the universal demand just now is for information upon the subject of Tuberculosis. The British Red Cross Society at the moment are encouraging their voluntary aid workers to take up the practical work of visiting and looking after cases of consumption, especially in their own homes, after returning from sanatoria, and in our schools.

Dr. Bardswell's book meets the occasion and will serve to help those devoting themselves to the care of consumptives. This manual covers the subject appertaining to tuberculosis in a very complete fashion: conditions which predispose to tuberculous disease are given succinctly and sufficiently; the latency and the manifestations of tuberculosis, and the many forms in which it shows itself in different organs are clearly set forth; the principles of treatment explained in a simple yet complete fashion.

The great subject of prevention is handled in a masterly manner, and in a fashion that all who run may read. The so-called "Care Committees," springing up in different parts of the country, composed for the most part of voluntary workers who are in touch with the social life of the people, are performing useful work by acting in co-operation with official administration in anti-tuberculosis work. These voluntary workers focus their attention upon the families within their sphere of work and become the outposts of observation in the great fight against tuberculosis. When the bread-winner of the family gets laid aside the members of the Care Committee can relieve anxiety by applying to proper quarters where financial help may be obtained, so as to appease his anxiety in regard to his family's maintenance, and by getting the infected person removed to a sanatorium early in the disease prevent the infection of others living in the same house. All the essential difficulties that require seeing to are ably dealt with by Dr. Bardswell in a manner at once authoritative, humane and convincing.

A section of the manual dealing with the care of the tuberculous child is worthy of close perusal; it is practicable, bears the mark of an intimate knowledge of the subject, and all the troubles that develop when a member of a family is attacked by consumption. We congratulate Dr. Bardswell on his work, and thank him for giving the nation a guide so simple, so complete, and so adapted to present-day wants.

Annotations.

Blackwater Fever (Leonard S. Dudgeon, *Journal of Hygiene*, vol. xix, No. 2, October, 1920).—The author gives the following summary of his investigation:—

(1) True jaundice, due to the presence of bile pigment in the plasma, occurred in a high percentage of the cases which ended fatally. Hæmoglobinæmia, varying from deep red coloration of the plasma to a faint tingeing, occurred in the acute stages of the disease. There was no evidence of auto-agglutination or auto-hæmolysis. The fragility of the red cells was unaltered. No relationship between syphilis and blackwater fever was obtained. Spirochætes were not demonstrated in the blood in any instance. In the hundred cases in this series a malarial history was obtained in every instance and without exception the infection was contracted in the Balkans during 1915-1918. The only blood parasites found were *Plasmodium vivax* and *P. falciparum*.

(2) The most important tissue changes were as follows: Fatty degeneration of the myocardium. Reduction of the fat lipoid content of the adrenal gland. Enlargement of the Malpighian corpuscles of the spleen due to various changes in the endothelial centres. Recent or chronic perisplenitis was present in every instance. The other changes in the spleen were numerous and variable and due to blood destruction and malaria. Hæmorrhages in the liver tissue and foci of central necrosis, in which reactionary changes had occurred, were met with in many instances. Inspissation of the bile in the gall-bladder and bile passages was of common occurrence.

The changes in the kidneys during the acute stages of blackwater fever were very pronounced, but complete recovery rapidly ensued during the period of convalescence without subsequent nephritis as far as the information available indicated. Spirochætes were not found in any of the tissues in this disease. Scattered hæmorrhages occurred in the most rapidly fatal cases.

(3) From alcoholic and acetone extracts of the dried residue of the urine, obtained during the period of hæmoglobinuria, hæmolytic substances were demonstrated. From alcoholic and acetone extracts of the dried organs very active hæmolytic substances were obtained, more especially from the acetone extracts. The alcoholic extracts of the urine were more potent than the acetone in the three cases which recovered. Similar results were not obtained by extracting the dried viscera from other cases other than blackwater fever, including malaria.

(4) There was no evidence that quinine administered by any method during the attack of blackwater fever increased the severity or influenced the progress of the disease apart from its effects on malaria. Quinine administered to animals rendered anæmic did not excite hæmoglobinæmia. Quinine was obtained from the urine by extraction, during the period of hæmoglobinuria, in amounts which corresponded to those obtained in the malarial cases. Rabbits injected with quinine previous to and during the period when both ureters were ligatured failed to develop hæmoglobinæmia or hæmoglobinuria.

(5) The urine in cases of blackwater fever rapidly returns to the normal from the period of hæmoglobinuria. Clumps of red cells which possess certain characteristics were found in the urine in some cases. Clumps of red cells were of common occurrence in the tubules of the kidneys. The injection of sterilized urine from cases of blackwater fever obtained during the period of hæmoglobinuria failed to produce any ill-effects in animals.

(6) Blackwater fever was most frequently met with during the months of March and April, at the time when the temperature was at the commencement of its upward summer rise. No evidence was obtained that blackwater fever is in any way related to anaphylaxis. It was not possible to employ any method to demonstrate whether blackwater fever is due to a filter passer.

The Intestinal Animal Parasites found in One Hundred Sick Filipino Children (Philippine Journal of Science, January, 1920).—F. G. Houghwont and F. S. Horrilleno have made an elaborate study of one hundred sick Filipino children with regard to intestinal parasitism. Of the total number 92 per cent. were found to be infested with one or more parasites Under one year the incidence was 66·6 per cent., the youngest being seven months old. All the children between two and thirteen were found to be parasitized. No pathogenic protozoon was encountered. The apparent immunity of the Filipino child to forms such as *Entamœba histolytica* and *Balantidium* may have a physiological basis in the child. The incidence of *Spirochæta euryyrata* was 61 per cent. Although no significant phenomena were recorded further investigation of this parasite is called for.

No definite train of symptoms other than those specifically pathogenic could be attributed to intestinal parasites. Several patients not parasitized presented symptoms that might easily be attributed to parasites. Concomitant infestation with *Trichuris* and *Ascaris* was accompanied by a train of symptoms referable to the digestive tract that presented an almost characteristic picture. The clinical diagnosis of this case was usually ascariasis.

No data were secured that would aid in determining a possible influence of parasitism on the mental development or of effects on the nervous system. Nor could any satisfactory evidence concerning the influence of parasitism on the incidence or course of ileocolitis be obtained.

Infestations with *Trichuris* and *Ascaris* were regarded as offering a serious problem in pediatrics. The combination of the two helminths is specially serious, inasmuch as the entire alimentary tract is involved. Children occasionally purge themselves of *Ascaris* infections, particularly if they are complicated by *Trichuris* infection. This occurs through vomiting or defæcation of the worms, or both.

Helminth infections were restricted to the nematoda, no infections with either cestoda or tremada being encountered. It was suggested that the lung stages of *Ascaris* may be responsible for much of the respiratory disease among Filipino children. Infection with hookworm was found in twelve per cent. of the series, no differentiation between *Necator* and *Ancylostoma* being made. Only one severe case was recorded, and it was suggested that the traditional mildness of hookworm disease among the Filipinos should not produce a false sense of security.

Sanitary conditions are a heavy factor in the infection of children. Parasitism starts coincidentally with bottle or artificial feeding, but even breast-fed children do not entirely escape.

Domestic animals do not appear to be important factors in the spread of parasitism among Filipino children.

Houghwont and Hoerrilleno believe that intestinal parasitism, both directly and indirectly, contributes heavily toward the high death rate in young Filipino children. Sanitary conditions are largely responsible, and the problem is one of education of the masses in simple domestic hygiene, and calls for the development of the principles of parasitism and preventive medicine on a particularly high plane in the Philippine Islands, where parasitic infestations are probably more common than in any other country from which there are records.

Endolimax nana and *Dientamœba fragilis* are reported for the first time from the Philippine Islands, and *Entrichomastix* is provisionally reported.

Abstracts.

YAWS; WITH A REPORT OF A CASE WHICH DEVELOPED IN A TEMPERATE CLIMATE.[1]

By Lieutenant Commander C. S. Stephenson, M.C., U.S. Navy.

An American sailor, white, aged 26, married, was admitted to the sick list December 15, 1919, in Brest, France, complaining of headache and fever of 101° F. At this time he had a sore on the chin, another on the body near the left nipple, one at the nasofrontal junction, and three or four on the scalp. He says that he ran a daily fever for about a week and always had some headache and bone pains. He got better except the sores, and on January 4, 1920, was transferred to the United States with the diagnosis of impetigo contagiosa.

On admission, January 14, 1920, he presented the following crusted, circumscribed and pustular, foul-smelling lesions: one on the forehead, one on the top of the head of one month's duration, two that looked very like ringworm of the scalp located on the occiput. These he had had for about three weeks. One at the peno-scrotal junction of about two weeks' duration. The most interesting were those at the frontonasal junction and one on the chin. They were both granulomatous and not unlike a fig, both for colour and consistency. The one on the forehead was about the size of a small strawberry and bled easily when examined.

The lesions of the head were ulcerative and distinctly ring-shaped, with raised borders, and had a tendency to bleed when touched. All the lesions of the scalp exuded a yellowish foul-smelling discharge which had a marked tendency to crusting.

At the time of admission the accuracy of the diagnosis was doubted as it was believed to be a case of syphilis—the lesions frambœsiaform syphilides, excepting the two on the occiput which were believed to be ringworm. Scrapings were made from these and found negative for mycelial threads. Two days later the Wassermann report came back 4 plus in all antigens, but doubt arose over the character of the lesions and the patient was taken to Vanderbilt Clinic for consultation. Various diagnoses were made by the attendants with the majority voting for syphilis. A Brazilian dermatologist was visiting that day and gave the unhesitating diagnosis of yaws. Immediately serum from the lesions was examined and treponema demonstrated. Sections were taken from the biopsy, reports of which follow: Intravenous administration of arsephenamine 6 grm. and salicylate of mercury intramuscularly ·065 grm. once a week. The improvement was little short of marvellous after the first dose of arsephenamine, and after the third practically all the crusts had fallen off. It is interesting to note that he had a chill on the day following the third dose of arsephenamine. His blood was examined, and many parasites of benign tertian malaria were found. The arsenic was discontinued and intravenous quinine substituted for malaria. He had one moderately severe reaction following the quinine and made an uneventful recovery. One month after admission the Wassermann was still plus 4 in all antigens. No open lesions. He was given 30 days' leave and on his return to the hospital his blood was still plus 4. Another dose of arsephenamine was given and the blood was found to be 3 plus. Two more doses were given and he was sent to duty after 90 days well. Wassermann negative—all antigens.

[1] The *Military Surgeon* (Navy Number), vol. xlvii, No. 3.

Pathological Reports.

(1) Sections stained with hæmotoxylin and eosin show tissue to be composed largely of irregularly hypertrophied epithelial tissue with a relatively small amount of corium, the surface being covered with exfoliated epithelial cells, hæmorrhage and debris. Through the tissue proper there is marked infiltration by polymorphonuclear leucocytes with here and there small abscess-forming undoubtedly secondary infection.

(2) Sections stained by Levaditi method of staining show treponema fairly numerous in the epidermis and not in the corium. It was unfortunate that tissue received did not include a larger section of corium on account of the fact that an important point of differentiation between the pathological picture of a skin lesion due to yaws and a skin lesion due to syphilis is the finding of the *Treponema pertenue* in the epidermis in yaws and the *Treponema pallida* in the corium in syphilis.

(3) Diagnosis, yaws.

Low Power.—The slide can be divided into two areas, one of which is deeply infiltrated, the other slightly so. Over the first area there is a fairly marked acanthosis with enormous thickening of the granular layer. These features are lacking in the second area.

The infiltration in the main involved area extends from just below the epidermis down for three-fifths of the section. In the second area it is disseminated and lies about the vessels and skin adenexia in numerous foci in the upper three-fifths of the section.

High Power.—In both areas the infiltration consists almost entirely of large succulent polyhedral plasma cells. The vessels are slightly increased in number and somewhat dilated, but there is no inflammatory change in the walls such as found in syphilis. Neither is there any change in the connective tissue such as might be indicative of syphilis.

Summary.

Acanthosis plasmoma speaks either for syphilis or yaws. Probably the latter because of the epidermal changes and the absence of vascular disturbance.

Diagnosis.

From bromide eruption which it may well resemble. The history of taking bromides and eliminating the drug will clear this point.

Syphilis.

Primary lesions differ from secondary ones.
Pleomorphism of lesion.
Affects mucous membranes.
Visceral involvement.
Central nervous system involvement.
Primary sore usually genital.

Yaws.

Primary and secondary lesions identical.
No variations of lesions.
Only affects the skin or region at junction.
Viscera spared.
Absence of cord and brain involvement.
Primary sore always extra-genital.

Yaws is distinguished from (1) Actinomycosis and rhinoscleroma by the absence of their specific organisms. (2) From the lepromataides by the absence of Hansen's bacillus. (3) From mycosis fungoides by the absence of "fragmentation" of the infiltrating cells, and of degenerative changes with the formation of products of degeneration in the collagen and elastin; by the presence of the epidermal changes peculiar to yaws. (4) From tuberculosis, apart from the tubercle bacillus, by the absence of the characteristic architecture with its giant cells, daughter plasma cells, more marked disintegration of the fibrous stroma and complete disappearance of blood cells.

From syphilis by the following details, which, considered collectively, strongly suggest that yaws and syphilis are different histological entities: (*a*) Cellular infiltration: plasma cells not so definitely arranged in rows or clustered around the blood vessel as in syphilis; no large multinuclear cells (ebloriplaques), or true giant cells, or intracellular hyaline degeneration noted in yaws; (*b*) fibrous stroma: rarefaction of collagen more marked than in syphilis, but no organization or celloid degeneration found, such as occurs in syphilitic gummata; (*c*) blood vessels: no distinct proliferative changes in the vessel walls or endothelium, as frequently occur in syphilis; (*d*) epidermis: marked proliferation and down growth of the epithelium, with great thickening of the horny layer (due to hyperkeratosis or parakeratosis) are characteristic of yaws, while they are unusual in syphilis.

COMMENT.

It is interesting to note that almost two years had elapsed since the patient had been in a country known to have endemic yaws, and the disease developed in the winter when the possibility of fly contamination was exceedingly small. He had not been away from Brest, France, for more than nine months.

The most likely source of infection was from a barber shop where he had been shaved regularly. This place was patronized by French colonial troops recently returned from Africa, and it is believed that this is where he became infected. Another probability is from an Algerian trooper who helped him make repairs on telephone lines, but he did not notice anything wrong with this soldier. The first thing he noticed was the sore on his chin, but he does not recall being nicked by a razor. It is probable that this is where the infection gained entrance and that it was the "mother" yaw. The lesions on the occiput so closely resembled ringworm of the scalp that almost every one seeing them made that diagnosis.

The improvement of the skin condition after the first dose of arsephenamine was little short of marvellous. The lesions began to dry, many of the scabs dropped off, and by the end of the week the discharge had almost lost its odour, and by the middle of the following week had entirely ceased.

A SIMPLE METHOD OF CULTIVATING THE MICRO-ORGANISM OF ACTINOMYCOSIS.[1]

By M. H. GORDON, M.D.

CASES of actinomycosis are apt to be overlooked unless film preparations are invariably made from all purulent material submitted for bacteriological examination. The writer has had experience of two tragic cases in which, apparently from this omission, the true nature of the disease was only diagnosed shortly before death. One of these cases was a young woman who had suffered for some months from metastatic abscesses; a number of consultants had been called in, but as blood cultures were negative and cultures from the pus had only yielded staphylococcus, the condition was thought to be due to that micro-organism. The writer saw the patient for the first time a few hours before her death. A film of pus discharging from a sinus in the wall of the abdomen when stained by Gram revealed the typical actinomycotic mycelium. The other case was an empyema of some standing which had been attributed to the pneumococcus. Here again the detection of actinomyces, which was present in abundance, was effected too late for treatment either by iodide or vaccine to be of avail.

The second point to which I wish to draw attention is that the actinomyces fungus can be readily cultivated in ordinary nutrient broth to which a few drops of fresh human blood have been added. It is advisable to sow the material in two blood broths, one of which is covered by a layer of oil 1 cm. deep. After incubation for a few days at 37° C., the actinomyces fungus can be seen growing at the foot of the tube in small white masses—like little puff-balls. As a rule, growth occurs first in the broth covered with oil, but when other bacteria are present the actinomyces may come up first in the aerobic tube. Before using this method the writer could never get a satisfactory primary growth of actinomyces, but since employing it he has succeeded in doing so with ease in all of seven cases. The practical advantage of getting a growth is that a vaccine can then be prepared. In two cases in which a vaccine of the homologous organism was employed improvement resulted. In the majority of the cases, however, vaccine treatment was not attempted, as secondary infections were present and the disease was too far advanced. Vaccination with a stock actinomyces vaccine is, in the writer's experience, useless; it seems essential to employ the actual strain infecting the patient. In the case of patients whose lesions clear up under vaccine treatment, it is wise to preserve a phenolated suspension of the vaccine in a sealed glass tube, so that it may be available in case of recurrence. In one case recurrence took place after an interval of nearly two years.

[1] Abstracted from the *British Medical Journal*, March 27, 1920.

A METHOD OF CHOLERA DIAGNOSIS.[1]

By Captain Arthur Davies, R.A.M.C.

The details of the technique are as follows:—

(1) Put a platinum loopful of fæces into a test tube containing 5 cubic centimetres of ordinary 1 per cent. peptone water (slightly alkaline to litmus). Incubate for eighteen hours.

(2) From each of the resulting cultures, pipette one drop of the peptone water growth on to one of the divisions of a Garrow agglutinometer slab. (Twenty-four specimens can he conveniently examined on one slab.)

To each of these drops is added a drop of Lister cholera agglutinating serum (1/80 dilution).

The slab is then rotated for three minutes (at the rate of one revolution per second) so as to bring the drops of culture and agglutinating serum into intimate contact.

At the end of this period the slah is removed and examined in a suitable light, when it will he found that cultures containing vibrios give well-marked agglutinated clumps ohvious to the naked eye.

The positive cultures are kept for further investigation, the negative being discarded.

(3) All the positive cultures are assembled, also bottles containing agglutinating serum in dilutions of 1/320 and 1/640.

Pipette on to the Garrow agglutinating slab one drop of the 1/320 dilution of cholera agglutinating serum; one drop of the 1/640 dilution of cholera agglutinating serum; one drop of normal saline.

To each of these drops add an equal drop of the culture under examination. Rotate the slab for three minutes, remove and examine. Cultures containing vihrios give well-marked agglutination clumps, obvious on naked-eye examination, i.e., the peptone culture contains cholera vibrios agglutinated by the specific agglutinating serum in a dilution of 1/1280.

(4) These positive cultures can be further investigated by plating them out on any suitable medium (e.g., MacConkey, alkaline agar, &c.) Suitable colonies are selected for sub-culture and subsequently for biochemical reactions.

This arrangement enabled the medical officers in charge of wards to examine their cases and to arrange for the dispatch of stools in the morning, and for the segregation and treatment of cases returned as positive in the afternoon and evening.

Accuracy of the Technique.

In order to establish the accuracy of the technique, the first hundred peptone water cultures reported as positive were plated out on MacConkey medium. In each case the cholera vibrio was recovered from plates, and in each case the vibrio isolated gave the correct morphology and biochemical reactions of Koch's cholera vibrio. Each vibrio exhausted the full titre of the Lister cholera agglutinating serum used. No anomalous vibrios were found. The only slight variations were in the degree of acidity and rapidity with which the acid was produced in lactose and mannite. These first hundred plate cultures invariably corroborating the results obtained under Stage 4 during the remainder of the epidemic.

Rate of Reporting.

Each worker can report on 150-200 specimens per day, for as many days as an epidemic lasts. The technique involves no mental strain. The rate of reporting depends chiefly on the number of peptone water tuhes available.

Antagonism of Intestinal Organisms to th Cholera Vibrios.

A sharp scrutiny was kept on the peptone water cultures for evidence of the *Bacillus pyocyaneus* or other micro-organisms that might kill the cholera vibrio during incubation.

The *B. pyocyaneus* was conspicuous by its absence, as far as could be ascertained from the observations made of both plates and peptone cultures. During the early days of the epidemic, an emulsion of 5 cubic centimetres of fluid fæces was sown with a loopful of a peptone culture of cholera, and kept on the laboratory bench. Suh-cultures in peptone water at weekly intervals for two months invariably gave positive results on incubation, showing that the cholera vihrio had held its own with the other intestinal organisms for this period. These observations enabled us to accept stools for examination from different camps.

Microscopic Examination of Positive Peptone Cultures.

A considerable numher of these peptone cultures which gave positive readings by my technique and from which the vibrio had been recovered from plates, were examined hy the hanging-drop method and stained films. Even at the end of the epidemic, when considerable experience had been gained, the vihrios present were recognized with difficulty. If reports had been sent out on such examinations, the error would have heen great and it would not have heen possible to control the epidemic under consideration.

Possible Errors.

In the Bandi "Method of Rapid Cholera Diagnosis," the suspected fæces is inoculated into peptone water containing agglutinating serum, but this method is modified on account of the too great expenditure of agglutinating serum involved for the carrier examinations on a large number of cases. A preliminary and ordinary peptone water culture is made from the fæces and looked through after twelve hours. Those cases without vihrios are not proceeded with. Those with vibrios are inoculated into peptone water, containing cholera serum of two or three times its titre strength, and agglutination looked for after two hours.

This modification, in my opinion, economizes agglutinating serum at the expense of accuracy. It is especially desirable in the case of carrier cases, where vibrios may he comparatively few, to be independent of the necessity for microscopic examination for the preliminary selection of cultures.

[1] Abstracted from the *Journal of the Royal Army Medical Corps*, vol. xxxv, No. 4, October, 1920.

Current Literature.

Bulletin de la Societe de Pathologie Exotique. September, 1920.

Pathogenic Action of a Fungus Parasite on Bamboos in Central Africa.—J. Bequaert was suddenly seized with violent colic, accompanied with persistent diarrhœa and pains in the joints of the limbs after having slept with a cryptogam under his bed. The fungus was an *acidium* form of an Uredinea, and was found growing on a bamboo of the species *Arundinaria alpina* K. Schumann, growing on the slopes of the Ruwenzori Mountains in Central Africa. No analogous fungus of bamboos could be found mentioned in the *Sylloge fungarum* of Succardo and previous travellers to the Mountains of the Moon seem to have been unacquainted with it, though its pathogenic action was familiar to the natives. The symptoms rapidly disappeared on removal of the cause.

Ionoid of Arsenic in the Treatment of Paludism.—V. Dupont recommends a new arsenical preparation, a colloidal arsenic prepared by Fouard's method to which the name of ionoid of arsenic is given. It is given in doses of 3 c.c. as intramuscular or intravenous injections which cause no pain or reaction, the drug possessing little toxicity.

A Case of Bronchial Spirochætosis in Brazil.—A. Carini records the first case of Castellani's broncho-spirochætosis in Brazil. A Portuguese married woman, aged 33, who had lived six years in Brazil, had an attack of influenza, the convalescence from which was prolonged. During the attack of influenza the sputum was bloodstained, and the bloodstained sputum reappeared during convalescence. Tubercle bacilli could not be found in the sputum, but spirochætes conforming in every particular with those described by Castellani were present in large numbers. Treatment by injections of neosalvarsan and of sodium iodide and tartar emetic and Fowler's solution by the mouth, as well as injections of the patient's sputum sterilized by ether, after the method recommended by Kraus in the treatment of whooping-cough, produced only slight improvement. The cough still persists with sanguineous sputum containing numerous spirochætes.

A Leucocytozoon of the Little Owl of Brazil.—A Carini found a leucocytozoon, as well as a halberidum, in the blood of the Brazilian little owl, *Scops brasiliensis*. It presents characters very similar to those of *Leucocytozoon zemanii*, and it is difficult to decide whether it is a new species or not. If so, the name *Leucocytozoon lutzi* is proposed.

The Probable Syphilitic Origin of Juxta-articular Nodosities.—Poupelain has observed five cases in a dozen years in the French hospital at Tcheng Ton which all developed in syphilties and disappeared under anti-syphilitic treatment.

Juxta-articular Nodosities in the Annamites: Treatment by Novarsenobenzol.—L. R. Montel constantly noted the co-existence of juxta-articular nodosities and syphilis, and that treatment by intravenous injections of novarsenobenzol lead to their complete disappearance.

Contribution to the Study of Trypanosoma venezuelense Mesnil 1910 (M. Leger and E. Tejera).—*Trypansoma venezuelense* resembles *T. evansi* morphologically, but serological and biological experiments confirm the opinion of Mesnil that they are two distinct species of trypanosome.

Strongyloides intestinalis Bavay 1877 in the Intestine of Man in Senegal.—F. Noc, V. Henry, and A. Esginer report the first two cases of the presence of this worm in the human intestine in Senegal.

Intestinal Parasitism in Annam (F. Motais).—Intestinal parasitism is very common in Annam; the association of parasites—as many as six different species having been found in one stool—brings the percentage of infestation to 140 per cent.

Experimental Infections of Dogs and Guinea-pigs with Cultures of Herpetemonas of Insects.—A. Laveran and G. Franchini having previously shown that severe and even fatal infections may be produced in white mice by the inoculation of cultures of flagellata from various insects, carried out experiments of the same order in the dog and the guinea-pig. In old dogs local sores resembling those produced by *Leishmania tropica* were produced without general infection, whilst in young dogs general infection with the presence of the parasites in the blood resulted without local lesions. Elongated forms of the parasite were observed having the appearance of herpetemonas without flagella. In the guinea-pig no symptoms were produced, infection only being revealed by histological examination of the blood.

The Prevalence of Leptospira Ictero-hæmorrhagiæ in the Wild Rats of Sao Paulo, Brazil.—W. G. Smillie inoculated guinea-pigs with the kidneys of forty-one normal-appearing rats captured in the city of Sao Paulo, with the result that four of the guinea-pigs developed typical symptoms of epidemic jaundice, and *Leptospira ictero-hæmorrhagiæ* were found in their organs. Three of the strains were cultivated by the method A of Noguchi. A large proportion of the guinea-pigs inoculated with rat kidneys developed a high immunity to a virulent strain of *Leptospira ictero-hæmorrhagiæ*. A large percentage—75 or more—of Sao Paulo rats thus harbour *Leptospira ictero-hæmorrhagiæ* of a low virulence which produced immunity in guinea-pigs without producing objective symptoms.

Ankylostomiasis and Beriberi in French Guiana.—W. Dufougère shows how ankylostomiasis has increased in French Guiana during the war owing to the relaxation of prophylactic measures. Cases of œdema also occurred in French Guiana which were found to be due to beriberi.

The Treatment of Leprosy by Intravenous Injections and by Ingestion of Emulsions of Chaulmoogra Oil.—L. Stevenel finds that chaulmoogra is a specific for leprosy when intensively administered as a well-made emulsion, either by intravenous injections, by ingestion, or by rectal administration. At the same time an appropriate alimentary regime causing decalcification of the organism is a great factor in bringing about a cure and should not be omitted.

Observations on the Pasteurelloses in Morocco.—H. Velu records epizootics of pasteurelloses amongst pigs and cattle in Morocco. The epizootics occur in the spring, and infection results from drinking contaminated water supplies. Good results, both curative and prophylactic, were obtained from the use of a polyvalent serum.

Two Cases of Cerebrospinal Meningitis in Goats.—H. Velu and F. Bosavy record two cases of cerebrospinal meningitis in goats with characteristic symptoms and autopsy findings, but in which no micro-organisms could be obtained from the blood or cerebrospinal fluid.

Paludism and Novarsenobenzol.—G. Paisseau recommends the systematic treatment of paludism by the combined use of intramuscular injections of quinine and intravenous injections of novarsenobenzol, each course comprising eight injections of 1·20 grm. of quinine and one of 0·15 grm. and eight of 0·30 grm. of novarsenobenzol in eleven weeks. Although sterilization does not result, relapses are prevented during the whole period with considerable improvement in the general condition as shown by increase in weight, disappearance of anæmia, and a return of strength.

Experimental Researches in the Rôle of the Gecko (Tarentola Mauritanica) in the Etiology of Oriental Sore (C. Nicolle, G. Blanc, and M. Langeron).—From the blood of two out of twelve geckoes at Tamerza, where oriental sore is endemic, a *leptomonas* distinguishable from *leishmania* and the *leptomonas* of the gecko at Tatouin was cultivated on the NNN medium. It grew extremely slowly, and was not virulent for man, monkeys, mice, or geckoes. Parasites are thus only seldom found in the blood of the gecko, but more frequently in the digestive tube. The gecko does not appear to play an important rôle as the natural reservoir of the virus of oriental sore.

The Reservoir of the Virus of Oriental Sore.—C. Nicolle considers that the hypothesis of the gecko or the camel being reservoirs of the virus of oriental sore should be abandoned, no proof of the hypothesis having been brought forward.

Stallions Clinically Cured of Dourine as Healthy Carriers of Pathogenic Germs.—E. Sergent, A. Donatien, and A. L. Héritier found that in stallions thoroughly cured clinically of dourine, whose blood was non-infective in doses of several litres, trypanosomes may suddenly reappear in the blood after an interval of more than three years. Hence a stallion which has suffered from dourine may remain infective even when presenting the appearance of a perfect clinical cure.

The Experimental Diagnosis of Dourine.—E. Sergent, A. Donatien, and A. L. Héritier recommend intraperitoneal injection of dogs with the blood of horses suspected of dourine. Only the positive results are of value, since $\frac{1}{50}$ to $\frac{1}{10}$ of the total bulk of the infected horse's blood may be so injected without result.

Experimental Infection of the Dromedary with Trypanosoma berberin of Debab.—Edm. and Et. Sergent and A. Donatien find that experimental infection of dromedaries with *Trypanosoma berberin* comprises two stages—an acute of three to four months and a chronic of months' or years' duration passing into a latent infection with relative immunity against reinfection. Wasting and weakness diminish the resistance of the dromedaries to every pathological influence, death being often due to a complication. In the female abortion occurs.

On the Heredity of Infection and Immunity in the Trypanosomiasis of Dromedaries.—Edm. and Et. Sergent and A. Donatien found that two baby camels, born of cured but still infected mothers, were not infected with trypanosomes or possessed no immunity against debab.

A new Flagellum of Rhodnius prolixus, Trypanosoma (or *Crithidia*) *rangeli*, n. sp. (E. Tejera).—In searching the intestinal contents of *Rhodnius prolixus* in Venezuela for *Trypanosoma eruzi*, a new crithidial form, named *Trypanosoma rangeli*, was found by Tejera to the exclusion of *Trypanosoma eruzi*.

Filarial Itch as a Manifestation of Volvulosis.—J. Monpellier Degouillon, and A. Lacroix consider that the microfilaria of *Onchocerca volvulus* and those found in the skins of dark races in filarial itch are morphologically identical and cannot be differentiated from them.

On the Relationship of Onchocerca volvulus and Filarial Itch.—E. Brumpt doubts the rôle of *Onchocerca volvulus* in the production of filarial itch, and he denies the identity of the microfilaria found by O'Neill in filarial itch with the embryo of *Filaria perstans*.

The Importance of the Cervical Papillæ of Ankylostomes.—M. Langeron points out that amongst certain spiroptera the cervical papillæ present sufficiently specialized modifications as to be characteristic of the species.

On Anaphylaxis from Quinine—Anti-anaphylaxis and Desensitization (Pasteur Vallery-Radot).—Remarking on a case of anaphylaxis from quinine taken by the mouth reported by Montel, Vallery-Radot states that desensitization may be brought about by giving *per os* a small dose of quinine an hour and a half before the harmful dose of quinine.

Original Communications.

PRELIMINARY NOTE ON THE TREATMENT OF NODULAR LEPROSY BY INTRAVENOUS INJECTIONS OF CHAULMOOGRA OIL.

By P. Harper, M.R.C.S., L.R.C.P.
Makogai.

The mixture used is the following:—

R Iodine	1 gr.
Ether	500 m
Ol. chaulmoogra	500 m

The chaulmoogra oil is *not* warmed to clarify. It is well shaken, so as to mix up its solid and liquid constituents, and then the quantity is measured off. The ether is relied on for clarification of the solution and, as a fact, the resulting solution is a fine clear maroon colour. The iodine is relied on for sterilization of the solution. For the first two or three days only 10 minims of the mixture (containing 5 minims of ol. chaulmoogra) is injected. Thereafter 20 minims are given. The following veins have been used for injection: ext. jugular, median basilic, median cephalic, small veins of forearm and of back of hand, cephalic, basilic, internal saphenous and veins of dorsum of foot.

The bigger the vein the better, because in a big vein the fluid is diluted more quickly by the blood. The injection may be given quickly for the first 5 minims of the mixture, but must thereafter be given very slowly, taking about three minutes for the 20 minims. Intravenous injections of 20 minims of the mixture are given daily for six days a week, none being given on the seventh day. I propose to continue this as long as indications point as at present.

An ordinary 20-minim hypodermic syringe with the finest possible needle is used.

Immediate Results.

(1) Taste of ether on injection of first 5 minims.

(2) Acceleration of respiration and pulse.

(3) Cough in cases with marked nasal or laryngeal disease.

Later Results.

(1) Four hours after injection there is a rise of temperature gradually reaching 100° to 101° and lasting about 8 hours, falling gradually to normal.

(2) Leucocytosis.

Remote Results.

It is too early to give a definite opinion. Literature of the intravenous exhibition of chaulmoogra oil is scanty. The only references I can find are in the *Tropical Diseases Bulletin*. M. Varham, Stevenal and Noc appear to have used minute doses, e.g., in Vol. XI of the *Tropical Diseases Bulletin* Varham's dosage is described as being ·00002 grm. per kilo of patients' body weight. This is about 1/40 (one-fortieth) of my dosage, and Varham's dosage appears to have been given on alternate days, whereas I give the drug daily for six days a week.

Varham first tried an emulsion of these minute doses in gum arabic, but later he seems to have saponified with NaOH.

So far I have given hundreds of these intravenous doses of chaulmoogra oil and ether (seventeen patients now under treatment and many more wanting to start it), and we have had no suspicion of fat embolus or other serious trouble. All patients have gained weight with one exception and his weight has remained stationary. I report my method (1) in order to put it on record and (2) to secure its trial in other Colonies.

NOTES ON THE PREVENTIVE USE OF QUININE.

By Dr. Harald Seidelin,

Principal Medical Officer, S. A. des Huileries du Congo Belge, Kinshasa, Belgian Congo.

The effect of quinine, whether therapeutic or prophylactic, has probably never been subject to more discussion than during the last few years. So far, unfortunately, the discussions have by no means cleared away the difficulties. Valuable material has been collected, but the conclusions drawn differ as much as ever, and often appear equally well founded.

It is impossible that all observations should be expressed in actual figures, and sometimes a general impression may count more than rows of such. But when figures are given, they ought to be both correct and accurate. Otherwise, they become misleading instead of instructive. Thus, when the author of a recent paper to which I shall return later (Pearson, 1920) states that 20 gr. of quinine orally correspond to 15 by intramuscular injection, he conveys—and means to convey—the impression that the same quantity of quinine would have greater effect by the latter method than by the former. But as he gives bihydrocloride (74·8 per cent. alkaloid, according to Ziemann, 1918) intramuscularly, and hisulphate (59·1 per cent.) orally, a simple calculation shows that the proportion between the quantities given instead of as 4 to 3 is as 197 to 187, the difference would appear so small as to be negligible.

As we wish to obtain the effect of quinine, not of an acid, it appears sound to administer the alkaloid, as some authorities do. With this I have no experience, but, with a few exceptions (euquinine when the taste is objected to), I have always used the hydrochloride, with 81·7 per cent. of alkaloid. The general use of such an effective preparation which apparently has no inconvenience, would among other advantages probably possess that of doing away with most of the indications for the use of quinine injections which would then be reserved for cases in which persistent vomiting makes oral administration impossible.

In prophylactic use, no method has proved effective under all conditions. Sometimes the daily administration of 20 or 25 cg., or of 5 gr. (32 cg.), has been a success, sometimes it has failed, and as much may be said about the administration of larger doses, generally one grm. (15 gr.), at longer intervals. A definite conclusion could probably only be arrived at by experimental study of the effect of quinine on the various parasites, controlled by exact observations in practice. Decisive results have so far been obtained in neither way. Many statistics have been published,

but I know of few figures which are both exact and comparable. Such figures could only be obtained through the long-continued administration for a long period, according to two different systems, in the same place, and at the same time, to two series of individuals chosen at random among a body of men who had never before been infected with malaria. The experiments would have to be repeated in the same way in places of different degrees of endemicity.

The problem ought admittedly to be solved on the strength of accurate observations and actual figures, and on such alone. But in their absence it may be permissible to go, on the one hand by personal experience, and on the other by logical reasoning.

The various methods fall in two groups, those of smaller daily doses, and those according to which larger doses are given at intervals. The underlying principles are so different that in all probability both cannot have even approximately the same value. It would help towards a general understanding if these principles were kept clearly in mind, and I submit that if one method has a decidedly sounder logical basis than another, the former ought in the first instance to be given a trial, and in the absence of opportunity for exact experiments should be adopted until another method be proved superior.

It appears to me that the logical basis of the "week-end prophylaxis" is more logical than that of any other system, and as it is often known only in a vague and general sort of way, I propose to state it here as I believe it to be accepted by most of its advocates.

(1) Our object is to prevent malaria parasites from establishing themselves in the blood, i.e., to kill them. For this purpose we know from the therapeutic use of quinine salts that small doses are useless, but we have good reason to believe that about 1 grm. of quinine hydrochloride per diem, for an individual of about 65 kilos body-weight, is effective, at any rate in infections of moderate severity. We have no reason to believe that the amount of quinine required to kill should vary to any great extent with the number of parasites. Presumably the concentration of alkaloid obtaining in the blood is decisive. Therefore the prophylactic doses should be the same as the therapeutic, i.e., about 0·015 grm. per kilo body-weight or, when individualization is impracticable, 1 grm. per diem per individual.

(2) In order to prevent disease, the prophylactic dose should be given before the parasites have increased sufficiently in number to produce fever, i.e., before the end of the natural incubation period, of which the minimum in "malignant tertian" infections is six days, according to Ross (1911).

(3) A certain amount of evidence tends to show that malaria parasites may acquire an increased resistance to the deadly effect of quinine. This we hope to avoid by killing them off, instead of keeping them under, living in the tissues, subject to the continued action of quinine, but unable to produce fever, until perhaps they have become "quinine-resistant."

To these fundamental principles I would like to add a few remarks.

The administration of 1 grm. every sixth day might perhaps be sufficient. But as we know from treatment that the cumulative effect is of importance, and have often seen parasites persisting in the blood after the first day's dosis of 1 grm., only to disappear after the second dosis, it is strongly advisable to add another day's administration and fix two consecutive days of each week for its administration. This has the great additional advantage that it makes it easy to remember, especially if one of the two days is Sunday, thus either Saturday and Sunday, or Sunday and Monday. Another additional advantage is that the dosis may be varied without having recourse to tablets of various sizes. Thus, individuals of between 60 and 70 kilos bodyweight take four tablets of 25 cg. each, on Saturdays and Sundays, individuals of 50 to 60 kilos four tablets on Saturdays and three on Sundays, of 40 to 50 kilos three on each of the two days, of 70 to 85 kilos five on Saturdays and four on Sundays, of 85 to 100 kilos five on each of the two days, and so on.

Should the prophylaxis fail a febrile attack would probably develop and be treated. On the other hand, by the daily administration of small doses we may expect chronic infections without fever, but with anæmia and cachexia, or with low fever, likely to present considerable difficulties for diagnosis and treatment.

If the prophylaxis has achieved its result, the administration of quinine may cease at once when exposure to infection comes to an end. On the other hand, the survival of parasites in an enfeebled condition in the blood, the result to be expected from the use of daily prophylaxis, would make it necessary to continue the use of quinine for a long time after return to non-infected places. We see, in fact, that the advocates of the small daily doses advise the continued quinine-taking at home, often during the whole of the leave.

It would be useless to give statistics, because I have no means of controlling whether the persons under my care actually take quinine with regularity. An no fair comparison between two or several groups would be possible, because the people who have sufficient intelligence, and sufficient confidence in their medical adviser, to adopt whole-heartedly the system recommended, are also likely to be particularly meticulous in adopting other preventive measures, such as those of mechanical prophylaxis. Thus, they would be less exposed to infection.

Therefore, I can only state that the results have been exactly as expected. For the last twelve years or so, whenever in malaria-infected countries, I have adopted and advised the adoption of this system, and I have never yet seen a case of malaria in an individual whom I had reason to regard as its regular follower. I have seen short fevers in individuals who had adopted it late in their tropical career having already been infected before. This is what one would expect. A few cases occurred in men who said they had adopted the system, but in which I could prove that they had not taken nearly the total amount of quinine corresponding to the period in question.

On the other hand, I have seen quite a number of cases in men who said that they were regular daily quinine-takers, but also this may be open to doubt. It appears, however, significant that it has also been

among their number that I have occasionally found numerous parasites in the blood on routine examination of men without any febrile symptoms. This occurrence I have never observed in people who had adopted the "week-end system."

As so many observers from different parts of the world have arrived at other conclusions it would be absurd to believe that this system would be effective under all conditions. But I consider it highly probable that it will prove so everywhere where endemicity is moderate and the fevers of no unusual intensity. In the treatment of malaria fevers in the parts of the Congo which I have visited, I have never found any reason to exceed the dosis of 1 grm. per diem, in 4 tablets taken in the morning with hourly intervals, for a man of average weight. In case of persistent vomitting, a similar quantity has been given in injection, but oral administration adopted as soon as vomiting has ceased.

Although my experience in the Congo has been obtained in regions very different from those discussed by Pearson (1920), my impression is the same that malaria here is a comparatively benign disease, certainly more benign than many cases I have seen in Yucatan, Mexico, and some in Jamaica and in West Africa. Even in Yucatan, however, where very severe cases occurred in native and Asiatic labourers who had taken no prophylactic quinine, it was hardly ever found necessary to give higher doses than the abovementioned.

It may perhaps be asked whether the very large doses of quinine now so much in use, have ever been required except in individuals who had already been taking large quantities as a preventive measure, and who had probably acquired their infection in countries where prophylaxis had been extensively used.

If a malarial infection is at all amenable to treatment, it may be expected that the dosis of quinine fatal to the strain of parasites obtaining can be determined, and the natural incubation period. The combination of these two factors should make it possible to determine in each case a prophylactic system likely to be effective and unlikely to produce quinine-resistant strains.

I would like to add a small remark of great practical importance. In all this work it is necessary to have a reliable and rapid method of microscopical diagnosis. No busy practitioner can find time for examining half-a-dozen thin blood films in a day. If he attempts to do so, he will run a great risk of missing positive results. It is disheartening to see that the thick film method after Ross, or Ross-Ruge, has not yet become universally adopted. It appears so far to be the only way in which a considerable amount of fairly reliable work can be carried out within a reasonable time.

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SPRUE.

In the Indian *Journal of Medical Research*, April, 1920, there is an article by Trevor B. Heaton, M.A., D.M.Oxon., M.R.C.P.Lond., on "Etiology of Sprue." It was written as a thesis for the degree of D.M., Oxford University, 1919. Many of our readers are no doubt acquainted with

the article, but to those who have not read it, it will repay them to do so. The number of suggested causes are legion—micro-organisms, climate, helminths, fungi, and a host of others. Their very number betrays the difficulty of elucidating this will-o'-the-wisp of ailments, and we are still engaged in the search after truth. Whether sprue is even a specific disease has not yet been settled, and the field is still open to investigators and clinicians, more especially as regards treatment.

These uncertainties admit of empiricism to a degree that is unequalled perhaps in the wide field of medicine.

Empiricism extending to quackery prevails, for patients leave their doctors to try this and that "wise man or woman" skilled in "herbs" and secret remedies of sorts. Nor even are members of the medical profession free from fads and fancies in treatment which have little of scientific basis.

One of the best known was that of the late Peter Sys, a billiard marker in the Shanghai Club. He was born in Sumatra, it is said, and he brought with him to China a compound known as "Sys' powder," which in one form or another is used today in many countries. It is to be noted that in Java and Sumatra sprue as a disease was first reported and named, and it spread from thence to the Malay Peninsula, Ceylon, China and India. Its spread, so far at least as nomenclature indicates, was from the Equator northwards; it appeared in the South of China, and spread northwards from thence, and in India a similar course is recorded. Whether it was the disease that spread thus or the name merely is another question, most probably the latter, for we find "diarrhœa alba" and "chronic tropical diarrhœa" recognized ailments in India long before the name sprue was introduced into that country. The many theories of origin, such as hepatic exhaustion, a helminthiasis, a penetrating fungus, a pyogenic micro-organism, a protozoon of unknown nature, and a host of others are so far unfortunately "not proven." The writer, as so frequently stated in these columns, has long favoured the chemico-physiological origin of the disease, and he sees no reason to depart from it. It is not a popular line of thought at the present day, as it is not demonstrable in the direct, definite and readily apparent way that a bacterium or protozoon entity is. It requires investigation along a line that, as medical men, we have little training in, and consequently is troublesome. It is a branch of clinical work that will advance as the years pass.

All are agreed that the disease is one of long residence in the tropics. All also agree that the European digestive organs in a tropical climate are first stimulated to action by the heat, and subsequently decline in their activity, reaching a stage below the normal and again acquire their balance and proper tone. If this continues all is well, but the digestion is ever meagre in the tropics and wants watching and some consideration in even the most robust.

As life advances to late middle age in the tropics the digestive organs gradually lose their responsiveness, and a staid and set type of dieting prevails becoming stereotyped in its quantity, quality and variety (of which there is little). The digestive organs are not encouraged in their range of work, and certain of their functions and possibilities are allowed to fall into abeyance. The body is supplied with but a part of the nourishment it requires, and the digestive fluids being but poorly endowed cannot but degenerate in their powers and produce secretions which, going physiologically awry, lead to chemico-pathological productions. A general atony obtains, and the normal physiological secretions of the alimentary canal give place to fluids giving an acid in place of an alkaline reaction or vice versa. Ferments are thereby generated with results which are so markedly found in the alimentary tract from end to end. Diarrhœa supervenes, the bodily strength declines, and a mental perversion as regards food and treatment shows itself. The patient leaves off this and that food in the hopes of stopping the diarrhœa until a process of starvation, anæmia and diminished bodily and mental power and aptitude is engendered which defies the doctor to combat. Micro-organisms of various sorts invade the alimentary canal, and being found in stools (and tissues it may be) lead us astray in our efforts to ascertain the cause and nature of what is primarily a digestive ailment due to a chemico-physiological disturbance. The secretion of the mouth gives an acid, and at other times an intensely alkaline reaction; the gastric juice is well-nigh neutral; the contents of the small intestine lose their alkalinities and lend themselves to an acid fermentative process which causes the bulky stools, the frothiness of the pultaceous mass, and the loss of the natural colour of the intestinal excretion. The nourishment of the body is lessened, hence the weakness, the excessive amount of sleep demanded, the atony of the liver, &c., and when the powers of resistance fail the terminal fever supervenes. True sprue always ends in a rise in temperature, owing to micro-organisms and toxic products, from six to eight weeks before death.

The treatment of sprue resolves itself into two schools, the milk and the meat treatments. The latter is gradually gaining ground, slowly because of the trouble it entails. Be it noted nothing but evil will result from any attempt at a mixture of these plans of treatment. Milk never did go with meat. The Jewish laws as laid down in the Talmud forbid milk until two hours after fish, three hours after chicken, and four hours after meat. In no strict Jewish household at the present day even are milk puddings given after meat or flesh of any kind. The reason for this is apparent to those who think of the matter at all; but "physiological treatment" is not fashionable to-day. Milk for sprue gives no trouble in the way of treatment, and so the fetish continues. It is part of the "dock and nettle" system of treatment we follow, quinine for malaria, mercury for syphilis, and so on is the type of treat-

ment in vogue to-day amongst practitioners, whereas none of our great teachers and predecessors ever gave quinine alone for malaria, nor mercury alone for syphilis. We have fallen into the one tablet or tabloid for each disease, a state of things which neither experience nor physiology justifies.

Milk is given to "lessen the diarrhœa," it is said, but milk on reaching the stomach and intestine has its casein precipitated, which is excreted in a mass which looks like a solid stool, but it is neither fæcal in its smell, its appearance, nor its consistence. It is like a piece of cream cheese, and as the writer said, when asked to inspect a "beautiful" sprue stool as the result of milk; "it does not smell of fæces; it looks like a 'beautiful' piece of cream cheese, and if I did not know its origin, I would have no hesitation in eating it." Milk will not increase the size of the liver, for it does not call upon the liver or the bile to help to digest it; but meat will, and in a few weeks instead of many months or years. The fetish of milk and checking the diarrhœa is not the treatment of sprue, nor is the death of any of the secondary organisms which attend the pathological state. The primary disease is an atonied liver and allied organs; meat will stimulate them to activity, and by the stimulation of the secretion of bile and by that alone will the acid fermentation in the small intestine be checked and normal alkalinity restored and sprue cured.

J. CANTLIE.

Annotations.

Treatment of Threadworms with Carbonate of Bismuth (M. Loeper, *Progrès Médical*, 1920, p. 330.)—The usual rectal medication succeeds only imperfectly. The oxyuris develops in the large intestine but is generated at the end of the small, where enemata do not penetrate. Unfortunately, especially in the child, santonin and thymol are not without drawbacks and calomel has only a temporary effect. The author believes to have discovered a remedy which is efficacious and is non-toxic, even in children. He once prescribed bismuth carbonate for two patients suffering from gastric ulcer, and was surprised to find some months later that not only had their gastric symptoms disappeared, but that they were cured of oxyuriasis fromwhich they had suffered for months. Since that time he has adopted the treatment both in children and adults.

For an adult the minimum dose is 10 grm. daily in two doses. A child of 7 is given 4 grm. daily, and a younger one 2 or 3 grm. according to age. This drug has none of the toxic effects noted with the other remedies. The sub-nitrate of bismuth might possibly have the same effect, but occasionally is toxic.

Hypodermic Injections of Milk in the Treatment of Intolerance of Milk in Nurselings (Prof. Weill, *Lyons Journal des Practiciens*, September 20, 1920).—The child is given hypodermic injections of the same milk to which it is intolerant. One injection of 5 to 10 c.c. is usually sufficient. The mother's milk may be used raw or boiled, but cow's milk must be boiled or heated to 110° C. in a bain-marie for twenty minutes. The injection causes a mild general reaction and a slight rise of temperature. In most cases very satisfactory results are obtained, and the restlessness, vomiting, and diarrhœa disappear.

Operation for Pruritus Ani and Vulvæ (C. W. Allen, *New Orleans Medical and Surgical Journal*, vol. lxxiii, No. 4, October, 1920).—By this operation the author has in view the separation of the skin from the underlying tissues, thus dividing all the nerves which reach the affected parts, rendering these anæsthetic; a rapid cicatrization is prevented by packing, which is maintained until a firm bed of granulation has formed, which usually takes about a week, when the packing is discontinued. An anæsthetic area is formed which seems to be regarded by patients as a welcome change. It gradually diminishes in size after a few months with the return of normal sensation, and as yet no complaints of the return of pruritus have been reported. In the case of anal pruritus a series of incisions are made beginning at the anal margin and continued outward to about one-half inch beyond the affected area, which is rarely known to exceed two inches. The incisions are made at about an inch apart at their peripheral extremities until the entire perineal region has been covered.

The Therapeutic Use of Oxygen (R. D. Rudolf, *American Journal of the Medical Sciences*, July, 1920).—Oxygen is of value whenever a state of anoxemia exists, as in cases of mountain sickness, sickness from high flying, in poisoning by carbon monoxide, nitrites, and arseniuretted hydrogen, and in the effects of enemy gas. It should be employed in all cases of cyanosis, and in such acute respiratory conditions as pneumonia when anoxæmia threatens. The usual method of giving oxygen by holding a funnel connected with the oxygen cylinder near the face of the patient is practically useless; it should be given through a rubber tube inserted in one nostril, and this may be made more effectual if the opposite nostril is rhythmically compressed during inspiration, the mouth being kept closed.

Value of Complement Fixation Test in Tuberculosis, (R. Upham and A. J. Blaivas, *Journal of Laboratory and Clinical Medicine*, St. Louis, vol. v, No. 12, September, 1920).—The authors tested for tuberculosis patients who came for gastro-intestinal disturbances, and in whom tuberculosis was not suspected. The antigens used were those of Petroff, Miller and

Fleisher-Ives. There were eight positive results in the original technic with Petroff's antigen, four with Miller's, and three with Fleisher-Ives'. There was not a single case in which Miller's or Fleisher-Ives' antigens were positive that Petroff's was negative; on the contrary there were cases where Petroff's antigen was positive and Miller's and Fleisher-Ives' was negative. These conclusions are not regarded as final, as future experiments may prove otherwise. The authors agree with Singer and Ives that a serologic test for tuberculosis is desired that will be as useful as the Wassermann test in syphilis is, but they do not think that so far such a test has been found.

The Etiology of Dengue Fever (C. F. Craig, A.M., M.D., *Journal of the American Medical Association*, vol. lxxv, No. 18, October, 1920).—The author is of the opinion that dengue fever is caused by a parasite which is closely related to the one which causes yellow fever. As it has been proved that yellow fever is caused by a spirochæte, *Leptospira icteroides*, the search for a similar organism in the blood of dengue patients, the cultural and animal experimentation methods used being those followed by Noguchi in his demonstration of *L. icteroides*, is believed to offer the most promising chance of demonstrating the causative parasite of dengue. In 1906, unsuccessful experiments were made by the author and Ashburn, using every method available in an endeavour to find such an organism in the blood of dengue patients. The anaerobic culture methods devised by Noguchi, so successful in cultivating spirochætes together with improved methods relating to animal experimentation, are powerful aids to the investigation of disease, and it is thought that if properly applied in the study of etiology of dengue fever it is only a question of time before the causative parasite is found.

The Flagellate Character and Reclassification of the Parasite producing "Black Head" in Turkeys (E. E. Tyzzer, *Journal of Parasitology*, vol. vi, No. 3, March, 1920).—The author summarizes his investigation as follows:—

"*Classification.* Smith originally placed the parasite of the black-head, on account of its amœba-like characteristics, tentatively in the genus *Amœba*, and much later (Smith, 1915) retained the same generic name under a different spelling, *Ameba*. The view expressed by Hadley that this organism is identical with a previously described coccidium, *Eimeria avium*, is untenable, and was later abandoned by this author. Doflein's suggestion that the organism as a parasitic amœba should be included in the genus *Entamœba* now fails to apply with the discovery of flagellate characteristics. Both Jowett's (1911) and Hadley's (1916-17) incorporation of the parasite into the genus *Trichomonas* appears to be based upon a confusion of at least two intermingled species for a single species and is unacceptable without more conclusive evidence.

"The proof that this organism is not an amœba makes necessary its reclassification. Its trichomonad affinities are indicated by the type of nuclear division which it presents, by the number of flagella indicated in the five lines radiating from the blepharoplast and by the character of its pulsating movements which appear under certain circumstances so that it may thus be included in the family *Tetramitidæ*, Saville Kent, 1880, as modified by Chalmers and Pekkola, 1918. The assumption of amœba-like characters with respect to both movement and ingestion of solid particles together with its ability to invade vertebrate tissues appear to justify the creation of a new genus for the species. In case it should prove to be an aberrant form of a type species already described, the generic name here offered may then be suppressed. The name *Histomonas* is proposed for this genus, which may be defined as follows:—

"*Histomonas* gen. nov. Pleomorphic parasite Tetramitidæ with amœba-like phases of development within tissues of host. The kinetic structures, associated with blepharoplast, intraprotoplasmic during amœba-like phase. Nuclear division trichomonad in type with well-developed paradesmose.

"Apart from the pulsating forms in hanging drop preparations of material from lesions, flagellated stages are unknown. No contractile vacuole, no cytostome observed.

"Type species: *Histomonas meleagridis* (Smith, 1895) Tyzzer, 1919, *Amœba meleagridis* Smith, 1895, *Entamœba meleagridis* Doflein 1911, *Ameba meleagridis* Smith, 1915, *Eimeria avium* Hadley, 1909, *Trichomonas eberthi* Jowett, 1911, *Trichomonas* Hadley, 1916."

Abstracts.

THE TREATMENT OF LEPROSY, WITH ESPECIAL REFERENCE TO SOME NEW CHAULMOOGRA OIL DERIVATIVES.[1]

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THE USE OF CHAULMOOGRA OIL.

THE remedy to which we pin our faith as superior to all others is chaulmoogra oil. For many years it was used in Hawaii in its crude state, with results very similar to those obtained elsewhere. To the majority of patients it is nauseating and offensive to the stomach even when taken in slowly increasing doses by capsules, and its use has to be discontinued for a time, to be begun later at a diminished dose. Given intramuscularly it is painful and slow of absorption.

[1] Abstracted from the *Public Health Reports*, vol. 35, No. 34, August, 1920.

Many attempts at its modification have met with more or less success according to reports from various sources, and one report which has attracted especial attention is that of Dr. Victor G. Heiser, surgeon, United States Public Health Service, director of health for the Philippine Islands, published in 1914. Although the report covers but twelve cases, it is mentioned in this connection because it seems to have been the starting point of an awakened interest and especial effort in the Orient, where the treatment was tried with favourable results in various missionary hospitals in India and China. The Heiser formula is as follows:—

Chaulmoogra oil	60 c.c.
Camphorated oil	60 ,,
Resorcin	4 grm.

Mix and dissolve with the aid of heat on a water bath and then filter.

It is used intramuscularly and "the injections are usually made at weekly intervals in ascending doses. The initial dose is 1 c.c., and this is increased to the point of tolerance."

A review of the earlier literature covering the use of chaulmoogra oil may be found in *United States Public Health Service Bulletin* No. 75, January, 1916, by Surg. G. W. McCoy and Acting Asst. Surg. Harry T. Hollmann. Their summary of this review is as follows:—

"Our personal experience leads us to the conclusion that most writers have reached—that the oil is helpful to many cases of leprosy, perhaps the majority.

"The hypodermic method of administration, while not free from disagreeable complications, seems to have given good results, and, in view of the nature of the disease, ought to be given a further trial.

"We are sure that the use of chaulmoogra oil as at present practised is not the solution of the problem of the therapeutics of leprosy."

The use of injections of mixtures containing crude chaulmoogra oil along the lines reported by Heiser had given sufficiently encouraging results to stimulate further investigation, and was continued at the Kalihi Hospital in the period following the work reported in *Bulletin* 75.

A mixture of the following composition was employed:

Formula No. 1.

Chaulmoogra oil	500 c.c.
Olive oil	500 ,,
Camphor	5 grm.
Guaiacol	10 ,,

This method of treatment was employed on many patients with generally favourable results. In most cases the oil was given by mouth as well as by intramuscular route. The amount of oil which could be tolerated in this way varied considerably with individuals. The practice was to increase the dosage until the limit of tolerance was approximately reached. Lugol's solution, which was frequently administered, was likewise varied in doses, beginning with small amounts and gradually working the dosage up till the patient was receiving substantial quantities of iodine in this form.

This combination of intramuscular and oral administration was beneficial in the majority of cases, and in a number of them resulted in the patient's becoming apparently bacteriologically negative and being paroled from the hospital. A report covering twelve of these paroled cases is given by Hollmann. In the great majority of cases which became bacteriologically negative, there has been no reappearance of the disease.

Chaulmoogra Oil Derivatives.

Chaulmoogra oil is one of the few members of the group of fatty oils which are believed to have distinct physiological effects outside of their nutritive value. The fatty oils are of great physiological importance, but, hitherto, chiefly in relation to nutrition and the general metabolism of the body. In a series of papers from the Wellcome Research Laboratory, by Power and his collaborators, the constitution of chaulmoogra oil and some of the closely related oils was elucidated. They discovered a new series of fatty acids represented by two members—chaulmoogric acid, $C_{18}H_{32}O_2$, and hydnocarpic acid $C_{16}H_{28}O_2$. These acids differ from any other known fatty acids in that they rotate the plane of polarized light to a notable degree—chaulmoogric acid (a)d= +62·1° and hydnocarpic (a)d= +68.° The studies on their constitution indicated that each of these acids contains a five-carbon-ring nucleus. Both of these acids were isolated from chaulmoogra oil derived from the seeds of *Taraktogenos kurzii*, and also from the oil of closely related species belonging to the genus Hydnocarpus. Power and his co-workers did not concern themselves with the therapeutic use of chaulmoogra oil.

It would appear possible that the distinctive action of chaulmoogra oil, as heretofore reported, may be due to the glycerides of the unique fatty acids of chaulmoogra oil or to the presence of some other oil-soluble constituent not a glyceride. The first step in the attempt to identify the active agents would he the separating of chaulmoogra oil into fractions on groups of lepers. The separating of the glyceride mixtures which make up the various vegetable fatty oils is very difficult; the fatty acids obtained by the decomposition of the glycerides are somewhat more readily separated.

Sir Leonard Rogers, in his experiments using the intravenous injections of the sodium salts of the acids derived from the chaulmoogra oil, made use of fractions, separted hy Ghosh. The data presented by Ghosh showed clearly that he was dealing with mixtures of fatty acids, and probably very complicated mixtures. The separation of the constituent fatty acids from the mixed product derived from the saponification of chaulmoogra oils hy means of fractional crystallization is a tedious and complicated task, and Ghosh did not meet with much success.

It is quite clear from the results heretofore published that although there is a therapeutic agent (or agents) in chaulmoogra oil of marked value in leprosy, none of the attempts to isolate or identify this agent has led to conclusive results.

A recent publication of Sir Leonard Rogers describes the use of "gynocardate of soda" and "morrhuate of soda." His term "morrhuate of soda" refers to the

sodium soaps of the fatty acids of cod-liver oil, and he reports excellent results from the intravenous and bypodermic injections of this material. The fatty acids of cod-liver oil are of a peculiar and unusual type, altbougb not of the chaulmoogric series. If the results of Rogers are confirmed, it will appear that the fatty acids of cod-liver oil are useful in leprosy. Although it may be, as suggested by Rogers, that other "unsaturated fatty acids may also be expected to yield effective preparations against the acid-fast bacilli of both leprosy and tuberculosis," it seems to us unlikely that this is a property common to all unsaturated fatty acids. For example, oleic acid, which is unsaturated to the same extent as chaulmoogric acid, is a common body constituent, and it would therefore be rather improbable that weekly injections of, say 5 c.c. of a 3 per cent. solution of sodium oleate, amounting to 0·15 grm. dry material, would have any such effect in leprosy as has been reported following the use of even smaller quantities of the sodium soaps of the fatty acids of chaulmoogra oil. Obviously a wide and important field for chemical and physiological investigation has been opened by this work of Sir Leonard Rogers and our own work here.

As an initial step, the fatty acids of chaulmoogra oil were separated into four fractions in the chemical laboratory of the College of Hawaii. One of these fractions was chaulmoogric acid, and the other three were mixtures of acids having somewhat different properties. These fatty acid fractions are solids, and therefore unavailable directly for hypodermic or intramuscular injections. One of the first problems was to find a suitable form of material for injection which would allow rapid absorption into the circulation. It was found that the ethyl esters of the fatty acids were thin fluid oils lending themselves readily to intramuscular injections and were readily absorbed.

The four fractions originally tried out, and designated, respectively, "A," "B," "C," and "D," were of the following character:

Fraction "A": The ethyl ester of chaulmoogric acid.

Fraction "B": The ethyl esters of the other fatty acids readily separating on cooling the alcholic solution of the mixed fatty acids of chaulmoogra oil, doubtless containing considerable of "A."

Fraction "C": The ethyl esters of the fatty acids remaining in the mother liquid from the separation of the acids in "A" and "B" and yielding lead salts readily soluble in ether.

Fraction "D": Ethyl esters of the fatty acids accompanying "C" in the alcoholic separation, but yielding lead salts not readily soluble in ether.

The early results of the use of these fractions "A," "B," "C," and "D," together with some details of the methods of their preparation, are given by Hollmann and Dean.

The results published and a continuation of the same lines of work lead to the general conclusion that the therapeutic agent in chaulmoogra oil is able to survive the chemical treatments involved in the making of these preparations, and is itself distributed through all four of the fractions. The differences in results, using the different fractions, are not sufficient to warrant any final conclusions regarding their relative efficiency; patients receiving each of the fractions have shown marked improvement, have become bacterially negative, and have been paroled. It is impossible, however, to draw definite conclusions from this work because of the fact that all patients who received the injections also regularly received chaulmoogra oil by mouth in substantial quantities. We cannot say, therefore, whether the beneficial action in any particular case is due to the material injected or to the combined action of the material injected and that taken by mouth. The general observation that chaulmoogra oil taken by mouth has a beneficial but not decisive action lends colour to the belief that the most important factor in the improvement of the various cases is the injection material. As a series of experiments intended to develop the best method for leprosy treatment the plan followed was satisfactory, but it is not satisfactory as a method of demonstrating the relative efficiency of different fractions of the oil.

Distilled Esters.

As already indicated, the processes which resulted in the fractions "A," "B," "C," and "D," are of such a character as to make it improbable that any other material except fatty acids would survive them and be distributed in all four of these fractions. Still further evidence on this point was gained by a different system of fractionation. In this case the mixed fatty acids derived from the saponification of chaulmoogra oil were converted into ethyl esters by heating with absolute alcohol in the presence of dry hydrochloric acid gas, giving a mixture of ethyl esters of all the acids present in the crude oil. This acid mixture was distilled *in vacuo* at a pressure of 30 to 34 mm. The distillate was cut into three fractions of different boiling ranges, designated "E," "F," and "G." These distilled esters are colourless liquids. At the time the first work of this character was done no apparatus was available to provide higher vacua and allow satisfactory distillations. The fractions "E," "F," and "G," were used for intramuscular injections in a number of patients, beginning in January, 1919, and in some cases extending until the 1st of July of that year. It was found that all the cases receiving each one of the fractions "E," "F," and "G," showed improvement—some of them quite rapid—indicating that the methods employed in their production had not resulted in the destruction of the therapeutic agent or agents.

The same uncertainty surrounds the interpretation of these results in the cases receiving fractions "A," "B," "C," and "D," since all were getting chaulmoogra oil in capsules three times daily in addition to the weekly injections. We can say, however, that whatever virtue resides in the use of chaulmoogra oil derivatives injected intramuscularly in combination with the oral administration, that virtue is probably not lost or segregated to an appreciable extent by any of the chemical or physical conditions to which these various preparations have been exposed.

The use of vacuum distillations as a means of separating the esters of the fatty acids and the fatty

acids themselves is receiving extensive application in the chemical investigations now in progress.

The Administration of the Ethyl Esters.

The intramuscular injections are given once a week, Wednesday being known as "Injection Day." An adequate supply of injection material, together with syringes, needles, &c., is previously subjected to about 15 lbs. of steam pressure for from a half to one hour in the autoclave. Other methods of sterilization would doubtless answer equally as well; for instance, an ordinary kitchen double boiler ought to serve every purpose, especially when only a few patients are to be treated. The patients, instead of dreading what must be rather a painful performance, make a gala day of it and fill the hour with laughter, noise and chatter on the lawn outside while awaiting their turns.

The site chosen by us for the injection is the upper and outer quadrant of the gluteal region, alternating sides weekly. One of the patients, who is called the "painter," applies tincture of iodine to a spot the size of a silver dollar. The syringe is an ordinary 20 c.c. all-glass model, and the needle selected is a No. 20, although with the thin and limpid ethyl esters a smaller size would undoubtedly serve. Sterile needles, one for each patient, are in readiness: the material is poured from the flask into a sterile beaker, a patient assistant stands on one side with a previously prepared basin of cotton pledgets, and on the other side is the clerk, usually the laboratory assistant, record book in hand, to enter opposite the name in a properly ruled, dated column the number of cubic centimetres given each patient on that day. A syringe full of the material is drawn up from the beaker, then, with a small spring forceps, a needle is picked up from the large Petri dish containing them and placed on the stem of the syringe. The patients are taught to step lively, and one by one they quickly enter from the preparation room, the needle is passed its whole length to reach the musculature, and the proposed dose is gently administered. The instant the needle is withdrawn the assistant claps a pledget of cotton over the puncture and the patient's own hand is applied to retain it with a gentle pressure for a few minutes in the preparation room. By the time the operator has removed and discarded the used needle and replaced it by a clean one the next patient is in position. We can thus easily administer from 75 to 100 injections in an hour or two and do it well. Employing 1 c.c. as the initial dose, it is our custom at every second or third injection to increase the dose by 1 c.c. until we have reached a maximum of from 3 to 5 c.c., according to the age or weight of the patient.

A phenomenon noted by many other observers in using chaulmoogra oil injections occurs with us also; in a few instances, immediately following the injection, the patient is seized with a violent fit of coughing. It quickly begins to subside, however, and in less than five minutes has entirely disappeared, leaving no serious results.

As to effects, or so-called "reactions" following our injections, there is a considerable diversity of reports. Some claim that during the following twenty-four hours they experience creeping sensations of chilliness at times, that they are rather out of sorts and feverish, with an indifferent appetite, &c.; others say they do not notice any such symptoms; while all admit a soreness for a day or two, deep under the point of the injection. In a few instances we have taken the morning and evening temperature of all the patients on injection day and the day following, with the result that not 3 per cent. of the number showed any rise whatever, either on the evening of injection day or morning or evening of the day following. The rise of temperature in those who did show any appreciable rise did not exceed one degree; from which it may be inferred that the constitutional symptoms following our injections are practically nil.

While some have reported from other sources rather frequent abscess formation as derogatory to intramuscular injection of chaulmoogra oil, we are happy to report more favourable results, as in 4,892 deep injections administered from October 1, 1918, to the present writing (January, 1920), we have had but one case of resulting abscess.

Combined Iodine in Treatment.

For a number of years iodine has been employed in the treatments, chiefly in the form of Lugol's solution. Since the fatty acids of chaulmoogra oil are for the most part unsaturated acids, and therefore capable of adding iodine to form iodine compounds, it seemed possible to utilize this property to introduce iodine into the body either through the skin, by injection, or by way of the mouth. Iodine combined in this way has none of the irritating action of free iodine. We have been employing treatments since February, 1919, in which combined iodine has been used.

In the period between February 5 and March 12, 1919, nine newly received patients were placed in a group to receive injections of a preparation consisting of the mixed ethyl esters of chaulmoogra oil carrying 4 per cent. of combined iodine. Subsequently, the percentage of iodine has been varied between 2 and 8 per cent.

In addition to the weekly injections, these patients received capsules three times per day, containing the mixed fatty acids of chaulmoogra oil carrying 5 per cent. of combined iodine. The fatty acids were used instead of the oil itself because hydrolysis of the glycerides to fatty acids is the normal digestive process which precedes fat absorption. We were therefore using a predigested oil. We can see no advantage in the use of the sodium salts, as practised by Rogers, since these soaps would be reconverted into the fatty acids by the hydrochloric acid of the stomach. Between May 14 and June 4, 1919, two additional patients were placed on this treatment. About the last of June it became necessary to ship a considerable number of patients to Molokai on account of the crowded condition at Kalihi. This unfortunately caused the loss of four of our eleven patients in this experiment. The remaining seven have all been paroled. Since the cases sent to Molokai were the less promising ones, they would not have been fit for parole in November, and might, perhaps, never have become bacteriologically negative.

"Standard Treatment."

Because of the excellent process which patients were making on the treatment just described it was decided to adopt this as the standard routine practice, placing on this treatment all patients who were received, unless they were to be in some group for special investigation. As already indicated, we have done some shifting about with the proportions of iodine employed, and the standard treatment now consists in weekly injections of a preparation which consists of the mixed ethyl esters of the acids of chaulmoogra oil with 2 per cent. of iodine in chemical combination. The amount used starts at 1 c.c. and is gradually increased to a maximum of 4 or 5 c.c. for adults.

Three times each day, an hour and a half after meals, the patient receives capsules containing the fatty acids of chaulmoogra oil with 2½ per cent. of iodine chemically combined. The dosage for the first fifteen days is ⅙ grm. per 100 lbs. of body weight three times daily; for the second half of the first month ⅓ grm. per 100 lbs.; and after that 1 grm. per 100 lbs. of body weight. This means, for example, that a 150 lb. man would get 1½ grm. per dose, or 4½ grm. per day.

In addition to this treatment, the patients also receive such other medical care as may be indicated in each case

Treatment by Injections Only.

It has already been pointed out that the injection of various preparations has been accompanied by the oral administration of crude chaulmoogra oil or its derivatives. The experiences of others, as set forth in the literature of leprosy, as well as our own observations, point to the conclusion that the oil which passes through the digestive tract plays a minor part in the improvement noted. Much larger quantities are taken by the mouth than by injection; yet, when the injections are not employed the recovery is slow, uncertain, and incomplete.

In administering treatment on a large scale, great economy of material would be effected by using injections only, and the whole treatment simplified. In order to test the efficacy of the injection of our standard treatment without the feature of oral administration of the iodized fatty acids, a group of ten patients who had recently been admitted to the hospital, and had never received more than very small amounts of chaulmoogra oil, were placed on treatment by injection only. A small dosage of strychnine was given, partly for its tonic effect and partly for the psychological value of of having "something to take," like the others. It is too soon to draw final conclusions, but the results to date are very encouraging. Perhaps these patients are not improving quite so rapidly as those on the regular treatment, but they are certainly improving.

Accessory Treatments.

Although experience indicates that the chief factor in the good results we have attained is the intramuscular use of chaulmoogra derivatives, aided by those taken orally, it is nevertheless advantageous to make use of any adjuvant measures which have proved of value. It has been shown that aqueous solutions do not penetrate the sound skin, whereas oily ones do to greater or less depths.

Iodine liniment.—We have tried the superficial application of a "green oil" consisting of the ethyl esters of chaulmoogra oil, carrying combined iodine amounting to from 10 to 25 per cent. by weight. This oil penetrates well, especially when aided by brisk massage. Definite and convincing data covering its value are not available, but it is in considerable demand by the patients, who are given 50 c.c. vials and allowed to apply the oil three times daily.

Ointments.—For old and sluggish ulcers as well as for chronic eczematous looking spots and areas which need stimulating, we employ the ointment of ammoniated mercury of the United States Pharmacopœia, which we modify by mixing it with ointment of zinc oxide in equal parts when we desire to render it milder, or, on the other hand, if we have a lesion which requires something stronger, we rub into our ointment of ammoniated mercury a dash of finely powered salicylic acid, much or little, as the appearance of the lesion seems to indicate. Patients coming in with open sores or ulcers are expected to have them all healed in a few weeks' time, and they seldom disappoint us.

Trichloracetic acid.—While we never use the actual cautery as employed by Unna, we have had excellent results from painting nodules with pure trichloracetic acid, which immediately produces a considerable escharotic action; the skin turns white and there is more or less smarting and burning for a few moments. By the time the effects of the acid treatment have passed off, usually one or two weeks, the nodule is a little softer and a little smaller and the patient is anxious for another application. There is one serious drawback to the use of the acid, noticed also in the case of carbon dioxide snow used here some years ago, and that is its interference with the pigmentation of the part to which it is applied. In some cases the skin is hyperpigmented and in others hypopigmented. The former is illustrated in the case of a young woman still with us who over a year ago had decided thickenings over each malar region. Several applications entirely cleared up the infiltrations on the cheeks, but, unfortunately, left two unsightly areas, each the size of a silver dollar, almost entirely black. After several weeks, however, they began to fade, and now, after many months, they are barely visible. On the other hand, a young man, paroled over a year ago, the lobes of whose ears were similarly treated, has a distinct loss of pigment and it shows no sign of returning.

Nodular injections.—We have been cautiously trying the injection of material which we have employed intramuscularly directly into the leprous nodules. Of course, it is understood that this and the preceding methods are applicable only when the nodules are few; for instance, we have a few patients whose stay with us has been prolonged by the lingering nodular enlargement of the lobe of one or both ears, their other lesions having disappeared. With aseptic precaution, we slowly instil a very few drops in various parts of the nodule, employing for the purpose an

ordinary all-glass hypodermic syringe with the same technique as in our intramuscular injections; that is, slipping on a clean sterile needle for each injection. It is evidently rather painful and is followed usually by a considerable swelling which soon subsides, however, leaving the nodule appreciably softer and smaller. We think better progress is being made by the injections than by the external application of the trichloracetic acid. Both are good, and each has its use. For a very superficial, hard, nodular area the acid is preferable.

Heliotherapy.—Another accessory treatment used, rather crudely, however, at this hospital, is heliotherapy, or the employment of sun baths. We have had some remarkable cures of ulcerations, including the plantar pedis variety, in presenting them to the direct rays of the sun, but whether it is a case of *post hoc* or *propter hoc*, it is not easy to say. A patient enters the hospital and is found to have an ulcer as large as a silver dollar on the sole of the foot, extending nearly or quite to the bones. He has been a labouring man, on his feet nearly the whole of every day. We discover it only by inspection, for he does not betray its presence by the slightest limp in his walk, for the foot is absolutely anæsthetic. He is slightly anæmic and is put upon our ferruginous tonic; he is put upon our standard treatment of injections and capsules; he is handed a pair of crutches and absolutely forbidden to put a pound of weight on the foot affected or touch it to the ground in moving about. He gets his ulcer washed out every day with a permanganate solution. He gets three good meals a day, a good clean bed to sleep in by night, and all the rest and relaxation he desires by day. That ulcer begins at once to heal, sun bath or no sun bath. The sun-bath measure, however, is very popular with our patients. They have more faith in it, perhaps, than has their medical attendant; but no matter, sunshine is abundant and inexpensive, and as yet untouched by the high cost of living. The one great thing is that the ulcers fill and close. The above is not a fanciful picture, but one of constant occurrence with us; and we are ready to admit that heliotherapy is a therapeutic aid of no inconsiderable value. In cases of rebellious plantar ulcers, however, especially with necrotic tissues, nothing approaches in efficacy the operation of Goodhue of Molokai in thorough ablation of the affected parts and allowing the wound to heal by granulation.

Neural Leprosy.

Cases of leprosy of the nerve type are likely to be ignored at institutions as far as treatment is concerned, and attention is likely to be concentrated on nodular cases.

In view of our success during the past year with several instances of the neural type of leprosy, the conviction has forced itself upon us that it is highly important that all these cases should be brought in and subjected to the regular routine treatment for a course of several months at least, especially in the case of children or even of adults of more recent attack. We believe our remedies arrest the disease and prevent further destruction of hands and fingers, even when, as in long-standing cases, normal function cannot be restored.

But during the past year we have done better than simply arrest the destructive process; we have had the satisfaction of seeing marked improvement in a considerable number of these purely neural cases, and apparently a complete recovery in others. One young man who came in with a decidedly ataxic gait, unable to raise his body or his toes and with one hand so weak and deformed that he had been compelled to abandon the use of the typewriter a year before entering, so far improved before his parole that his disability in walking had not only disappeared but he became one of the leading tennis players and one of the swiftest runners in the compound. He has now returned to full and efficient clerical duty in an office. A woman with all fingers absorbed to less than half their original length, after a year's treatment, became able to write, to sew and knit, and to execute many movements and functions of which she had for years been deprived. We have had several cases of young men and boys who, on entering, were absolutely unable to button or unbutton their clothing and were compelled to accept assistance of their fellow patients, but who, after a few months' treatment, became entirely independent and self-reliant in that respect. We have some young women and girls who entered with little and ring fingers partially crooked, who are now able voluntarily to straighten them after many months of inability to do so.

Conclusions.

The following conclusions may be drawn from our recent experience in the treatment of leprosy:

(1) The intramuscular injection of the ethyl esters of the fatty acids of chaulmoogra oil usually leads to a rapid improvement in the clinical symptoms of leprosy. In many cases the lesions disappear, except for scars and permanent injuries, and the leprosy bacillus can no longer be demonstrated.

(2) When combined with iodine, the fatty acids of chaulmoogra oil and their esters give good results; but there is no adequate experimental proof that this addition of iodine causes any increase in the effectiveness of the materials used.

(3) All of the available evidence obtained from the use of fractions of the fatty acids of chaulmoogra oil indicates that the therapeutic action is due to one or more of the fatty acids of the oil or to some as yet unidentified substance associated therewith. The various methods of fractionation heretofore employed have failed to demonstrate the active agent.

(4) Although conclusive evidence is not at hand, it is probable that the oral administration of chaulmoogra oil derivatives is of minor importance compared with the injections.

(5) In treating leprosy, it is important to make use of all auxiliary agencies to build up and maintain bodily vigor.

(6) Hypodermic injections of the ethyl esters into leprous nodules are followed by marked swelling, with ultimate recession of the lesions. This is a

valuable auxiliary treatment for especially resistant lesions.

SUMMARY.

It has been sufficiently established that chaulmoogra oil contains one or more agents which exert a marked therapeutic action in many cases of leprosy. We can not say as yet that the disease is cured, since we have no test adequate to establish such a verdict. Whether or not the apparent cures are real and permanent, it is evident that we have a valuable agent at our disposal in the control of the disease.

PROTEIN SHOCK REACTION IN LEPROSY.[1]

By EMANUEL M. JOSEPHSON, M.D.
New York.

I HAVE had occasion to observe a protein shock reaction in a leper, and deem the observation of sufficient interest to report it. An unknown amount of a vaccine was accidentally administered with an intravenous dose of sodium gynocardate to a patient suffering from a quiescent but well advanced leprosy. A typical protein shock reaction followed shortly after the injection. For several days following the recovery from the shock the patient stated that he felt an improvement, notably in several anæsthetic areas. Within the week, however, there supervened a marked exacerbation of the disease. A crop of macules rapidly appeared, more markedly over the parts previously more extensively involved, the face and the arms; a chronic ulnar neuritis lighted up and once again became hyperacute, and the patient ran a low fever as compared with his previously subnormal temperature. When I last saw the patient two months later, the exacerbation had not yet subsided.

This case indicates that the protein shock reaction has some possibilities in the diagnosis of latent leprosy. The reaction, however, bears the very unpleasant feature of creating an exacerbation of the disease. But where there are no other methods of diagnosis, and when the importance of diagnosis outweighs the risk to the individual, the reaction might be put to the test. Experimentally its use is certainly pardonable in checking up cases of suspected cures where release of the patient from the leprosarium is advocated, and in preventing spread of the disease by immigration from the endemic zones.

It is a known fact that the course of leprosy is hastened by intercurrent infections even of a very mild nature. A scant experience with the disease has led me to believe that the same results may follow on reactions to vaccine subcutaneously administered and on anaphylactic reactions. Hesitation to put this theory to a test does not permit me to state the latter with any degree of positiveness.

[1] Abstracted from the *Medical Record*, vol. xcviii, No. 15, October 9, 1920.

Reports and Reprints Received.

"Paludisme et Dysenterie amibienne autochtones." Neveu-Lemaire et Zemboulis. Extrait des *Bulletins et Mémoires de la Société médicale des Hôpitaux de Paris*. (Séance du 9 Mai 1919.)

"Notices Biographiques, XXIII.—Adelphi Negri, 1876-1912." Joyeux. Extrait des *Archives de Parasitologie*, tome xvi, p. 161, 1913.

"Chaire de Parasitologie et d'Histoire naturelle médicale." Leçon inaugurale de Brumpt. Extrait du *Faculté de Médicine de Paris*, 8 Janvier 1920.

"Notices Biographiques, XXII.—Pierre Simon Pallas, 1741-1811." Joyeux. Extrait des *Archives de Parasitologie*, tome xvi, p. 134, 1913.

"Les Piroplasmes des Bovidés et leurs Hôtes vecteurs." Brumpt. Extrait du *Bulletin de la Société de Pathologie exotique*, tome xiii, No. 6, 1920.

"Quelques Coutumes gynécologiques et obstétricales de la Guinée française." Joyeux. Extrait dès *Archives mensuelles d'Obstétrique et de Gynécologie*, No. 9, 1912.

"Notes sur l'Etat sanitaire dans un Camp de Prisonniers en Allemagne." Joyeux et Dalle. Extrait du *Bulletin de la Société de Pathologie exotique*, tome viii, No. 7, 1915.

"Le Necator americanus en Haute-Guinée, notes d'épidémiologie." Joyeux. Extrait du *Bulletin de la Société de Pathologie exotique*, tome v, No. 10, 1912.

"*Hymenolepis nana* (v. Siebold, 1852) et *Hymenolepsis nana var. fraterno* Stiles, 1906." Joyeux. Extrait du *Bulletin de la Société de Pathologie exotique*, tome xii, No. 5, 1919.

"Quelques Coiffures indigènes en Afrique occidentale française." Mme. Blanchard-Zaborowska et Joyeux. Extrait du *Revue anthropologique*, trentième année, Nos. 5-6, Mai-Juin 1920.

"Note sur une Grahamella: *Grahamella museuli*, n. sp., trouvée dans le Sang de *Mus musculus*." Benoit-Bazille. Extrait du *Bulletin de la Société de Pathologie exotique*, tome xiii, No. 6, 1920.

Medical News.

THE Australian Medical Congress which recently met in Brisbane, Queensland, accepted a recommendation from the Dermatology Section, suggesting the appointment of a committee to report on the occurrence of skin cancer in Australia; and a resolution from the public health section, urging the establishment of a mosquito eradication campaign was also adopted.

THE Canton Hospital, founded in 1835, is celebrating its eighty-fifth anniversary this year. It is the oldest and one of the largest missionary hospitals in the Orient. In the past decade 120,000 dispensary and 20,000 in-patients were treated, and 14,000 operations performed upon in-patients.

Original Communications.

USE OF TOWN REFUSE FOR MOSQUITO WORK.

By E. P. Minett, M.D., D.P.H., D.T.M. and H. Capt. R.A.M.C. (T.F.).

Government M.O.H., British Guiana.

The city of Georgetown, British Guiana, situated at the mouth of the Demerara River, lies four feet below high tide level. The soil is a rich heavy clay, therefore very little in the way of sub-soil drainage is possible unless the upper layers of the soil are lightened by admixture with other substances to render them more porous. Surface water, the result of the heavy rainfall (approximately 100 inches per annum), can only be got rid of by expensive pumping machinery, or by using the fall of the tide and opening the sluice gates at low water.

In the old days of the Dutch occupation the only method of making up roads, sea dams, &c., was by digging canals. As the whole country is dead flat, to make a mound in one place it was necessary to dig a hole in another. The expense of bringing stone down from the interior was, and still is, so great that earth burnt in heaps by the roadside is largely used for road surfaces. This, of course, results in more holes being dug, and these become mosquito breeding-places.

During the last ten years the open stagnant trenches, caused by taking earth for road-making in the city itself, have been gradually and systematically filled in with refuse from the city. As the city is a beautifully laid out garden city, this refuse is largely of a vegetable nature with a proportion of domestic city refuse of the usual type and a small amount of trade refuse, sawdust, tins, clinker, &c.

Dead animals and such condemned meat as is dealt with by the Meat Inspector are destroyed in the town incinerator, but the bulk of the refuse, as described

Fig. 1.—Street drain before filling.

Fig. 2.—Street drain after filling.

above, is used for filling in low places in and around the town, which would otherwise become mosquito breeding-grounds, especially in the wet seasons.

Large areas of abandoned land around the city have been raised by this method and after a time used for building purposes. The open trenches down the centre of many of the streets have been filled in with rubbish, given a top dressing of clay soil, allowed to settle and remade until there is no longer a depression. The filled-in trench is then given a top dressing of burnt earth, sand, shell, or stone, and forms a beautiful shaded avenue, as shown in the illustrations.—Fig. 1 being a trench before treatment and Fig. 2 the same after filling in.

The result is shown as a wide shaded avenue for pedestrians in the centre and two wide roads for vehicular traffic on either side.

It has been found by experiment that it is not necessary to treat rubbish with paraffin or other methods to prevent fly-breeding, provided that each day's deposit of rubbish is covered with earth immediately the rubbish carts have ceased bringing rubbish for the day.

The cost of keeping trenches free from vegetation in order that the small fish, locally called "millions," can get at the larvæ is very great, and requires to be done frequently in a tropical country where vegetation is of rapid growth. Therefore, unless the trench is required for main drainage purposes filling in is considered the best remedy.

In filling in these trenches it is necessary that the filled portion of the trench should be higher than the surrounding land level; this is to allow for settling. We find that, using the type of refuse we do in British Guiana, after a few months filled in areas settle down to about two-thirds of their original height. Areas so dealt with are usually allowed to settle for at least six months. They are then remade and again allowed to settle before putting in a permanent concrete surface drain. The cost of doing this work for a trench 4½ ft. deep 19½ ft. wide works out about 22 cents per cubic yard for labour and supervision. The usual practice is to detail a Sanitary Inspector to remain on the job permanently during working hours, in order to make quite sure all rubbish is properly covered in at the end of the day's work, otherwise an unsightly collection of miscellaneous rubbish remains exposed.

Fig. 3 shows a filled in area completed and provided with a small concrete drain for surface water.

The above method is, of course, very slow, but it is efficient and permanent. It is the only method possible in a flat country, below sea level, and where no other material is available except at prohibitive cost. The soil for covering in the rubbish is obtained by digging out other trenches required for drainage purposes which have silted up so that the flow of water is impeded.

Fig. 3.—Completed concrete drain put in after settling down has finished and permanent level reached.

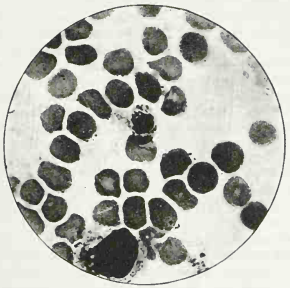
Oiling of trenches, ponds and marshy areas has been tried on a small scale in British Guiana but is not a success, especially in large areas of water, as the strong breeze prevailing during most of the year quickly clears the surface of oil and a film is not lasting, except in places shaded with trees, &c. On the coast lands shade trees are very rare; the few trees growing being mostly of the palm variety, coconut, or cabbage.

HÆMOGREGARINES IN BLACK RATS.

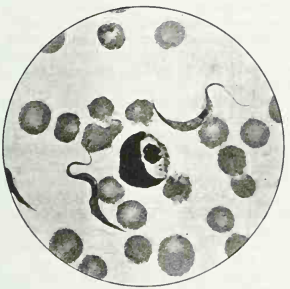
By G. E. F. Stammers,

Wellcome Bureau of Scientific Research.

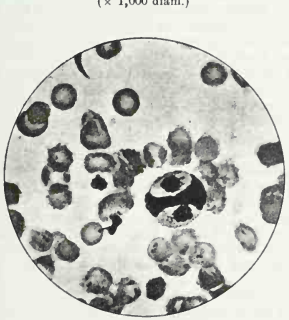
In the *Kitasato Archives of Experimental Medicine*, vol. iii, No. 2, for October, 1919, Shigeru Kusama, Katsuya Kasai and Rokuzo Kobayashi in their paper "The Leucocytogregarine of the Wild Rat with special reference to its life history" record the finding of hæmogregarines in wild black rats of Tokyo.



A free gametocyte. (In films from this rat all the parasites were extracellular). (× 1,000 diam.)



Intracellular form. (Also shows *Trypanosomum lewisi*.) (× 1,000 diam.)



An example of double infection. (× 1,000 diam.)

It does not appear from a reference to the literature that hæmogregarines have been described as occurring in wild black rats in Europe and it may therefore be of interest to mention that the parasites shown in the accompanying microphotographs were found in wild black rats from timber ships calling at the Port of London from Sweden.

So far hæmogregarines have not been found in native English black rats, only those from the above-mentioned ships being infected. Of the black rats from various sources so far examined 12·5 per cent have been found to harbour the parasite.

"Cream Cakes" and the Paratyphus B. (*La Presse Médicale*, October, 1920).—The authors, Lesne, Violle and Langle, of this interesting paper comment on the 700 cases of alimentary intoxication, collected by Lecoq, in which cream cakes figure as the cause. At first the symptoms were ascribed to the use of copper vessels, vanillin, synthetic vanillin and ptomaines; later it was decided that a micro-organism was the cause, and finally it was proved that the sole offender was the *paratyphus* B. The next question taken into consideration was the cream which caused so much morbidity. Studies of samples brought out the fact that the germs present were those belonging to the Salmoncloses, which are very similar to the *paratyphus* B., the difference being in the absence of reaction towards maltose. Cultures from the cream gave positive agglutination with paratyphoid serum, but the action was not specific owing to the fact that the test was also positive with the Eberth bacillus. The incubation of the fever of cream cake poisoning was very short, and the number of bacteria ingested at a time was enormous. The fever was only typical of *paratyphus* B. when the incubation was exceptionally long. Apparently the authors had not recourse to Castellani's absorption test with the object of finding out whether the paratyphoid-like bacillus isolated was the true *B. paratyphus* B. or *B. aertryke*, which can be differentiated from it only by using such a test. Bambridge and others have clearly demonstrated that most cases of food poisoning ascribed to *B. paratyphus* B. are in reality due to *B. aertryke*.

Treatment of Typhus Fever (G. C. Sbattuck, A.M., M.D., *International Journal of Public Health*, vol. i, No. 3, November, 1920).—The author emphasizes how greatly early hospitalization improves the prognosis, and of what importance for treatment is skilled nursing. The chief aims of the physician should be (*a*) to prevent or to reduce toxæmia; (*b*) to distinguish between circulatory disorders due to cardiac weakness and those attributable to vascular dilatation and to treat each appropriately; (*c*) to give careful individual attention to diet and bowels in all severe cases. Purgation, lumbar puncture, or the free administration of alcohol are occasionally useful in certain types of cases.

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THE JOURNAL OF

Tropical Medicine and Hygiene

DECEMBER 15, 1920.

THE ROYAL SOCIETY OF TROPICAL MEDICINE AND HYGIENE.

THE Council has just issued the thirteenth annual report of the Society. It will be seen that the work done and the enthusiasm which has prevailed ever since the Society was first founded increase from year to year. Several new paths of work have come under the scope of the Society, and its usefulness as a centre for tropical literature and for meetings of men interested in tropical medicine in the Empire and in other countries is much appreciated.

Many phases of tropical work have sprung up around us since tropical medicine first took a definite position in 1899. A list of these makes a formidable group. Beginning with the foundation of the two great Schools of Tropical Medicine in London and Liverpool, we find in the same year—1899—the first issue of THE JOURNAL OF TROPICAL MEDICINE AND HYGIENE appeared through the enterprise of Messrs. Bale, Sons and Danielsson. The reports of the Liverpool Tropical School added a second publication. Then came the establishment of the Society (now Royal) of Tropical Medicine, which during the first year of its existence published its *Transactions* in THE JOURNAL OF TROPICAL MEDICINE AND HYGIENE, but after twelve months the Society issued its own *Transactions*, adding thereby a third publication to the two already in being. The military medical staff—the R.A.M.C.—gave us a fourth journal dealing with general tropical medicine and surgery and hygiene, intended chiefly for the officers of the R.A.M.C., and mainly supported by them.

Cambridge in 1901 issued the *Journal of Hygiene*, and later, in 1908, the *Journal of Parasitology*, both largely devoted to tropical diseases. The Wellcome publications from the Khartoum laboratories have also filled a prominent place in tropical medical literature. In 1908 was founded the Tropical Diseases Bureau, now housed at the London School of Tropical Medicine; and the School itself published a short-lived tropical journal. Within the Empire also we have many journals issued locally dealing with clinical, pathological and sanitary matters in the Crown Colonies, in India, Australia, South Africa, and elsewhere.

The latest addition to the ranks of the study of tropical diseases is the Tropical Section of the Royal Society of Medicine, the *Transactions* of which will, no doubt, be published in the reports of the doings of that Society.

All are doing good work, and each fulfils a useful part in the dissemination of knowledge. At the same time efforts are thereby divided, and instead of a united effort, each stands in more or less rivalry—a rivalry which stimulates each body, but adds to the bewilderment of the medical men more especially abroad, and involves an expense which many practitioners in the tropics can ill afford. It also hinders busy practitioners gaining the information they may require in any one subject they are interested in. A great man will arise no doubt who will succeed in gathering these independent units into one; but until the original founders of these several items are removed from amongst them, there is but little chance of this being done, for each desires to see his creation maintained, and resents its being swept away by any other rival body which has sprung into being.

The Royal Society of Tropical Medicine and Hygiene, however, continues to hold its own, as the most recent report shows. Herewith is appended the report for 1919 of the Society:—

ROYAL SOCIETY OF TROPICAL MEDICINE AND HYGIENE.
THIRTEENTH ANNUAL REPORT OF THE COUNCIL.

Chief Events of the Year.

In January, 1920, the new edition of the Laws, which had been under revision by the Council, was passed, and has since come into operation. It will be useful to Fellows to have a short account of the chief changes:—

(1) Among the objects of the Society is now included "the study of the diseases and hygiene of the lower animals in warm climates"; this was always tacitly admitted, but, in view of the increased membership of veterinary surgeons, it was thought advisable to incorporate it in the Laws.

(2) There are now to be three Vice-Presidents in place of one. The effect will be to create two more vacanies on the Council at the biennial elections.

(3) Local Secretaries are to be members of Council when in London. It has long been a source of dissatisfaction that Fellows abroad had so little influence in the management of the Society; they can now, through their Local Secretaries, bring their weight to bear.

(4) Missionaries are no longer accepted at half-rates; the sum of 10s. 6d. does not suffice to pay for the *Transactions* which are supplied to each Fellow, and it was felt that this anomaly should cease. The new Law does not apply to present Fellows.

A complaint having been received from a Fellow resident abroad that the D.T.M. & H. was not a registrable diploma, and hence that its possession did not aid in securing an appointment from lay bodies, which consult the Medical Register, the Council addressed a letter on the subject to the Registrar of the General Medical Council. A reply was received to the effect that the General Medical Council had no power to enter this qualification on the Medical Register without further legislation, to which at present there were obstacles. There the matter for the time being rests.

An interesting development is taking place in Malaya. Dr. A. T. Stanton, who is a Local Secretary in that area—in which capacity he attended a Council meeting on May 14—has proposed to form a local branch of the Society, for the purpose of "promoting scientific and social intercourse among workers in tropical medicine." The experiment was approved, and its outcome will be watched with interest.

At the Annual Meeting in 1919, Professor W. J. R. Simpson, C.M.G., was elected President in the place of Sir David Bruce, K.C.B., F.R.S. Sir James Cantlie, K.B.E., became Vice-President, and Dr. Andrew Balfour, C.B., C.M.G., Treasurer. In May of this year the Society lost the services, as Secretary, of Dr. G. C. Low, Joint Secretary since September, 1912. The Society owes a debt of gratitude to Dr. Low for his work, and especially for having piloted the Society through the difficult period of 1914-19. Dr. C. M. Wenyon, C.M.G has succeeded him.

During the Session meetings were held in October, November, January, February, March, May and June. A return was made to the pre-war hour of 8.30. The meetings were well attended, and some interesting discussions were held.

The following papers were read at the meetings during the year: "Some Considerations regarding Preventable Diseases and their Prevention," by Professor W. J. R. Simpson; "Anti-Mosquito Measures in Palestine during the Campaigns of 1917-18," by Major E. E. Austen, D.S.O.; "Bacillary Dysentery," by Dr. Philip Manson-Bahr, D.S.O.; "The Etiology of Rheumatic Fever from a Tropical Point of View: a Flea the Probable Carrier," by Dr. J. Tertius Clarke; "Treatment of Malaria, and chiefly of Chronic Malaria and Blackwater Fever," by Dr. F. Roux; "Small-pox and its Prevention," by Colonel W. G. King, I.M.S.; "The Causes of Death from Malaria in Palestine: a Study in Cellular Pathology," by Lieut.-Col. N. Hamilton Fairley and Capt. H. R. Dew, R.A.M.C.; "The Etiology of Pellagra from the Standpoint of a Deficiency Disease," by Dr. Edward J. Wood; and "Recent Work on Roundworm Infection," by Lieut.-Col. F. H. Stewart, I.M.S.

Dr. Andrew Balfour contributed a Method of Demonstrating Spirochætes for Museum Purposes.

In March, the Society enjoyed the hospitality of the Royal Army Medical College, at the laboratories of which a very successful meeting was held. A large number of microscopic preparations were set out and demonstrated.

Fellows.

Since the last report 175 Fellows have been elected. This constitutes a record for one year, making a total of 1,157 since the formation of the Society. The number now on the books is 674.

The Council has to regret the death of one of the Society's Honorary Fellows, Sir William Macgregor, and, amongst the ordinary Fellows, of Dr. Albert Chalmers, Dr. James, C. M. Bailey, Dr. Alexander R. Ferguson, Dr. Arthur Neve, Colonel F. Wyville-Thomson, I.M.S., and, among ex-Fellows, of Sir William Osler. He had resigned his membership of the Society, but had, since the outbreak of the war, read a paper on "The War and Typhoid," and taken part in a discussion on the treatment of malaria.

Library and Headquarters of the Society.

The room forming the headquarters of the Society at 11, Chandos Street, is open daily from 10 a.m. to 5 p.m. for the use of Fellows, and the books and current periodicals in the library can be consulted.

Publications.

Six issues of the *Transactions* were made during the Session. As Fellows know, there should be eight, but the cost of production is such that the Council has not seen its way to return to the pre-war number. The Council is aware that the present type is unsuited to the tropical worker with his meagre means of illumination after sunset, and intends going back to the larger type as soon as paper is in freer supply, or finances on a firmer basis. It is intended next Session to hold six meetings for papers and two laboratory meetings.

A fresh issue of the Year Book is in course of preparation. The year in which each Fellow was elected will be given, with information as to which Fellows have served on the Council, or as Office Bearers, and for what period. Mistakes in the list will be avoided if Fellows will inform the Secretaries promptly of changes of address or of any inaccuracies in the last list.

Fellows coming home on leave should at once notify the Secretaries, 11, Chandos Street, W.1, or should call and record their addresses. If they wish, the Editorial Secretary will be pleased to print such information in the succeeding issue of the *Transactions*, under headings: "Reached England," "Left for ——," "Change of Address," &c. The Society's journal could usefully carry out this function, but the Editor would be dependent on the information supplied to him.

Fellows who do not keep the Secretaries thus posted cannot expect to receive their *Transactions* regularly.

The Secretaries will be glad to hear of any papers, long or short, which Fellows wish to communicate to the Society. They would welcome an increase in the offers of short communications. Full-dress debates do not always perform as well as they promise, and the type of paper received by the Société de Pathologie Exotique of our French colleagues has many advantages over the monograph. The *Transactions* should be recognized by the Fellows as a medium for publication of any interesting observations they may have made.

Messrs. J. C. Phelp and Son, 64, Beulah Road, Walthamstow, E.17, are the agents for the sale of the *Transactions* to the public, and copies of the current issues are supplied by them to non-Fellows at the price of 3s. 6d. each.

A title-page and table of contents for each volume is issued with the June issue of the *Transactions*, and loose cases for binding will be supplied on application to the agents, at the price of 2s. 6d. each, post free (inland), or if the copies are sent to them for binding, 4s. complete.

Local Secretaries.

The office of Local Secretary has now an increased importance. Fellows who think that they are insufficiently represented in their districts should write to the Secretaries, suggesting the names of suitable Fellows as Local Secretaries. Such nominations would naturally carry more weight if they were supported by several Fellows. The ultimate decision in the case of any appointment must rest with the Council.

Annotations.

The Clinical Significance and Therapeutic Indications of Abnormal Blood-pressure (A. S. Blumgarten, M.D., F.A.C.P., *Medical Record*, November, 1920).—The author has carried out a long investigation on the significance of abnormal blood-pressure. When the blood-pressure varies from the average, it is the hypertension that is mostly of clinical importance. He attempted to emphasize its importance in conditions where the blood-pressure itself is the dominating objective feature. Under these conditions its importance lies in its vital prognostic value in association with the definite evidence of injury to the vascular system or the kidneys. Without this associated evidence it is merely the pressure gauge of a life of tension, except in those instances in which it records the effort on the part of the endocrine system to adjust itself to temporary discord. When it occurs in young people and is not associated with vascular or renal phenomena, it is probable that the manifestation of hyperpiesis or hypertension is largely produced by intensive living, which in the majority of cases is followed by vascular and visceral changes, the most measurable of which are in the kidney.

Hypotension may be regarded as an endocrine stigma, and is merely an individual marking of an endocrine disturbance. It is amenable to treatment only in the absence of vascular or renal changes, and the best results are obtained by relaxation in everything—work, diet, pleasures, &c. Medicinal substances are not of great value.

Coffee and the Vitamines (P. D. Mattei, *Policlinico*, Rome, vol. xxvii, No. 37, September, 1920).—The author confirms that pigeons develop typical deficiency polyneuritis and paralysis if fed on polished rice; but if given 8 c.c. of a 5 per cent. infusion of coffee, the nervous symptoms disappear, and the pigeons become apparently normal again for a time, although they do not gain in weight. This satisfactory condition is maintained for several weeks, the coffee making up for the deficiency in the rice. The infusion of unroasted coffee has not the same effect as the roasted, and the author suggests that the beneficial effect of coffee is due to the generation of certain substances by heat in the roasting, these substances having a similar effect to true vitamines.

Body Temperature determined by Temperature of Urine (T. Kasparek, *Journal of Laboratory and Clini-*

cal Medicine, St. Louis, vol. v, No. 12, September, 1920).—The author as the result of an investigation comes to the conclusion that the temperature of freshly passed urine is of great practical value in determining the temperature of the body. This applies mainly to cases in which measurement by rectum is impossible or ohnoxious; it is also of value as a diagnostic method in diseases of the urinary tract.

Abstracts.

A METHOD OF CONCENTRATION OF PARASITIC EGGS IN FÆCES.[1]

By William H. Gates.

After straining through a sieve a large quantity of material, or using a smaller quantity without this, fæces are centrifuged first with water to wash off surplus lighter material, and later with sodium chloride, or better, calcium chloride solution, specific gravity 1,250, to remove the hulk of the material and float the eggs practically free from sediment. The top 1 or 2 c.c. are then removed with a pipette, drawing chiefly from the rim of the menisicus, and centrifuged again with water, which throws the eggs to the hottom. The water is then poured off, leaving *all* of the sediment at the bottom. This sediment is agitated vigorously hy holding the tuhe in the closed hand and pounding on the tahle. This stirs up all or nearly all of the eggs which may have stuck to the bottom, though a few eggs cannot he removed except with a hrush. The sediment is quickly poured into a small dish. The centrifuge tuhe is rinsed out by squirting water forcihly into it, and this is also poured immediately into the dish. The eggs settle rather rapidly and are loosened from the bottom hy forcing a little water around the edge to produce a slight whorl. Then before the eggs have a chance to settle, agitate the dish in the same circular direction so that the water tends to form a vortex, gradually diminishing the motion until it is hardly more than a jar. Practically all of the eggs will be found to have settled within a very small field.

For gross examination with the low powers, the eggs may he left in the dish and examined directly. To examine more carefully under a high degree of concentration, draw up with a pipette a small quantity of water from the centre of the mass of eggs; hold this vertical and steady for a half a minute or so. Most of the eggs will settle, so that a single drop forced out on the slide will contain nearly all, if not all, of the eggs drawn up into the pipette. For still further concentration, allow the eggs on the slide to settle, and then with a hlotter or lens paper very carefully remove a portion of the water from the top of the drop and add another drop. If repeated with care, a large mass of eggs may he collected in the space of a cover slip. This is especially satisfactory if the eggs have been in alcohol for the alcohol will evaporate, leaving the eggs in the centre.

[1] Abstracted from the *Journal of Parasitology*, vol. vii, No. I, September, 1920.

Current Literature.

The Indian Journal of Medical Research, Vol. VII, No. 1, July, 1919.

Records of the Occurrence of Intestinal Protozoa in British and Indian Troops in Mesopotamia.—C. L. Boulenger found marked differences as regards the frequency of *Entamœba histolytica* in British and Indian troops in Mesopotamia hoth in cases of dysentery and in non-intestinal cases, the difference heing most notahle in the acute dysentery cases, where the percentage for Indians is twice that for British. The percentage of *Giardia* (*Lamblia*) *intestinalis* is remarkahly constant in the two classes of patients. *Trichomonas* was more commonly found among the Indians, whilst *Chilomastix* (*Tetramitus*) was found more ahundantly amongst the British.

Report on Bilharziasis in Mesopotamia (C. L. Boulenger).—Only one outhreak of bilharziasis occurred among the troops in Mesopotamia up to August, 1918, seventy-one of the personnel of a General Hospital having become infected with *Schistosoma hæmatobium* at Basra in 1917. Investigation of the Arah population of Mesopotamia showed that the disease was common throughout the country hoth in the Tigris and the Euphrates districts, the average infection of the male Arahs examined heing approximately 20 per cent. The mollusc *Bullinus contortus*, known as the second host of the parasite in Egypt, was found in Mesopotamia, hut does not seem to be of common occurrence in that country.

Coma as a Cause of Death in Diabetes (McCay, Banerjee, Ghoshal, Dutta and Ray).—As the result of an elahorate series of hlood examinations in diahetics, with and without albuminuria, in cases of renal disease, with and without uræmia and in normal individuals, coupled with the ahsence of any real signs of acidosis in Indian diabetics, the authors conclude that acidosis and diabetic coma practically do not occur in India, and that the coma that commonly ends the scene in India is uræmic and not diahetic. They found no essential difference hetween the chemical condition of the hlood in those with uræmia and in those dying in coma who have heen suffering from diahetes, except for the presence of hyperglycæmia in the latter, and this can hardly be regarded as a cause of coma. The outstanding feature of the dying diahetics is the great increase in the non-protein nitrogen of the hlood. Acetone, urea, phosphates, &c., may be increased to a greater or less extent, hut the signs of acidosis are far too slight to enable one to ascribe the coma to the meagre retention of acetone bodies in the hlood. Hence the functional derangement of the kidney that accompanies diabetes is the all-important factor in producing the necessary conditions of the hlood that lead to coma and death.

The type of coma most commonly met with is that characterized by restlessness, followed hy

drowsiness and gradually deepening coma. The respirations may be quickened slightly; there is practically never any typical "air hunger." Cheyne-Stokes respiration may be present.

They consider that the influence of renal elimination has not been taken sufficiently into account in the various forms of coma that may terminate diabetes, and that it will be essential in future to pay more attention to the retention and accumulation of nitrogenous waste products within the body than to the possible depletion of the body of so-called "buffer-salts," which is supposed to lead to acidosis and coma. They suggest that the favourable influence exerted by the starvation of patients on the verge, or in the early stages, of diabetic coma, so long as the kidneys continue to act, can best be explained on the hypothesis that the coma is uræmic in nature. The injection of alkaline solutions, normal saline, &c., so long as they cause a free flow of urine, will assist in eliminating the poisonous nitrogenous bodies, and thus their beneficial effects in treatment are made evident. So far as they neutralize any acid bodies present in the body they will also assist. If, however, the excretory functions of the kidneys have become seriously disturbed, the injection of these solutions is useless and no treatment is of any avail.

The Treatment of Diabetes in India (McCay, Banerjee, Ghosal, Dutta and Ray).—The onward march of glycosuria, from the pre-glycosuric stage, transient and intermittent stages, to a permanent condition, can be reversed by prolonging the intervals between meals. Even severe cases of the Indian type of diabetes can be made sugar-free and the hyperglycæmia reduced to a normal glycæmia by a restricted dieting for a few days. The glycosuria of India is a true diabetes from the beginning, since "it is a specific deficiency of the power of assimilating food" (Allen). The specific function of the internal secretion of the pancreas is below normal in those who develop glycosuria. The prevailing form of diabetes in India is of a very mild type, milder than the *Diabetes levis* of Europe. Patients rarely die from diabetic coma, and the type shows little tendency to pass into the grave forms of the disease.

Reduction of the carbohydrates below the level of the patient's tolerance is practically never followed by signs of severe acidosis. A trace of acetone may occur in the urine, di-acetic acid is never found, and the ammonia content of the urine remains unchanged, hence the fear of acidosis and coma is imaginary.

Patients were kept on a low carbohydrate diet for several days, or even weeks. Hyperglycæmia and glycosuria disappeared. The different proximate principles could then be effected without the return of hyperglycæmia and glycosuria. Starvation was unnecessary to prevent acidosis—a practical asset in treatment, as the Indian patient much prefers a diet of milk, green vegetables, and a little butter to nothing at all.

The Pathology of Experimental Rabies. I. Kidneys, Adrenals, Liver, Pancreas, Spleen (J. W. Cornwall).—The growth of the rabies organism in the central nervous system causes irritative stimuli to pass along the splanchnic nerves to the adrenals and liver, which give rise to the discharge into the blood-stream of an excess of sugar. There may or may not be an accompanying excessive secretion of adrenalin.

The toxic agents in the blood derived from the growth of the rabies organism in the central nervous system seriously damages the cells of the secreting tubules of the kidneys and the medullary cells of the adrenals, whilst the pancreas, liver, and spleen escape damage.

The Pharmacodynamics of Quinine. II. Some Effects of Quinine on the Kidneys, Adrenals, and Spleen of Healthy Rabbits (J. W. Cornwall).—Quinine administered intravenously and intramuscularly to healthy rabbits for eight to nine months causes damage to the cellular elements of the kidneys and adrenals, and the rate of disintegration of red blood corpuscles in the spleen is increased.

The Pathogenesis of Deficiency Diseases. III. The Influence of Dietaries deficient in Accessory Food Factors on the Intestine (R. McCarrison).—Dietaries deficient in accessory food factors give rise in pigeons and in guinea-pigs to congestive and atrophic changes in all coats of the bowel, to lesions in the neuro-muscular mechanism, to impairment of its digestive and assimilative functions, and to failure of its protective resources against infection. The functional perfection of the gastro-intestinal tract is dependent in considerable measure on the adequate provision of accessory food factors derived from fresh fruit and vegetables. Certain gastro-intestinal disorders in man may owe their origin to the long-continued sub-minimal supply of accessory food factors.

IV. The Influence of a Scorbutic Diet on the Adrenal Glands.—A scorbutic diet causes pronounced depreciation in functional activity of the adrenal glands in guinea-pigs. The impairment of adrenal function occurs before evidences of scurvy manifest themselves.

Notes on a Monkey Plasmodium and on Some Experiments in Malaria (R. Knowles).—During the course of some animal experiments undertaken to test Schaudinn's hypothesis that relapse in malaria is due to a reversion of a female gametocyte to the malaria ring by a process of parthenogenesis, Knowles encountered a new plasmodium, which he provisionally terms *Plasmodium semnopitheci*. In the Lanuman monkey *P. semnopitheci* shows resemblances both to the B.T. and M.T. parasites of man. In its early forms it is an almost non-pigmented ring, closely resembling that of M.T., though some of the rings are larger and more flimsy and more resemble B.T. rings. The gametocytes recall those of the B.T. parasite. Innumerable free forms also

exist, some undergoing schizogony whilst extracellular. They seem to possess a definite cycle of development. The malaria experiments yielded negative results.

The Association of the Bacillus of Hofmann with Diphtheria in India (R. Knowles).—Knowles investigated two limited epidemics of diphtheria in schools in Shillong and Gauhati originating from carrier sources. The incidence of the bacillus of Hofmann was entirely different from that in temperate climates. It was found in 30 per cent. of cases of diphtheria, in 11 per cent. of diphtheria carriers, in 0·4 per cent. of healthy throats among European children during an epidemic, and in 5 per cent. of the throats of Indians in the absence of any epidemic.

The bacillus of Hofmann was encountered before along with, and after Klebs-Löffler bacilli in the same throat. Whilst the two organisms differ on morphology, cultural reactions and pathogenicity, it would appear that there is a symbiotic relationship between them. The rarity of the bacillus of Hofmann in India may be associated with the relative rarity of epidemic diphtheria, the reverse holding good in temperate climates.

Observations on the Cultural Methods of Gonococcus (G. C. Maitra).—Maitra found that the coccus is best cultivated under reduced oxygen tension. Primary cultures grow equally well on Löffler's blood serum or urine agar with egg-yolk, provided a fair amount of purulent exudate is used, while subcultures grow better on Löffler's blood serum. Bacterial yield can be augmented by the addition of *fresh*, preferably *human* serum, whilst human serum heated to destroy its bactericidal properties gives no advantage over fresh serum in promoting the growth of the gonococcus.

A Note on the Prescnce of Acid-fast Bacilli in the Blood of Lepers (K. R. K. Iyengar).—Acid-fast bacilli agreeing morphologically with the leprosy bacillus are demonstrable in a considerable proportion of blood films made from lepers. Although they are presumably present in the blood, it is possible that they may have been derived in the process of venepuncture. The skin at the site of puncture showed no sign of leprosy. The possibility of their presence in the reagents has been excluded by not finding them in the blood films from healthy controls.

The examination of the blood may be used with advantage as a routine method of diagnosis in cases of suspected leprosy, and may afford evidence of infection when other methods of examination have failed.

On the Possible Spread of Schistosomiasis in India (S. Kemp and F. H. Gravely).—None of the species of mollusc which have been cited as intermediate hosts for the human forms of schistosomiasis have been found in India, and that any of them will henceforth be discovered is improbable. The genus *Planorbis (sensu lato)*, has numerous representatives in India; but *Bullinus*, *Physopsis* and *Hypsobia* are not known to occur. There is, however, no reason to discredit the view that a potential intermediate host may exist, and that the return of infected troops from Egypt will possibly result in an outbreak of schistosomiasis in India.

All attempts to infest molluscs artificially with miracidia of human schistosomiasis were negative.

Reports and Reprints Received.

" Importance des Papilles cervicales des Ankylostomes." Langeron. Extrait du *Bulletin de la Société de Pathologie exotique*, tome xiii, No. 7, 1920.

" Contribution à la Faune helminthologique de la Haute-Guinée française." Henry et Joyeux. Extrait du *Bulletin de la Société de Pathologie exotique*, tome xiii, No. 3, 1920.

" Enkystement d'une Cercaire du type *Cercaria armata* chez un Turbellarié d'eau douce." Joyeux. Extrait du *Bulletin de la Société de Pathologie exotique*, tome xii, No. 3, 1920.

" Notes sur l'Eurroctus montanus, Urodèle apneumone caractéristique de la Faune corse." Dehaut. Extrait des *Comptes rendus des Séances de la Société de Biologie*. (Séance du 23 Octobre 1909, tome lxvii.)

" Espèces européennes du genre *Phlebotomus* (Rondani)." Larrousse. Extrait du *Bulletin de la Société entomologique de France*, 1920, No. 4.

" Note sur les Culicides de Macédoine." Joyeux. Extrait du *Bulletin de la Société de Pathologie exotique*, tome xi, No. 6, 1918.

" Biologie de *Cimex Boueti*." Joyeux. Extrait des *Archives de Parasitologie*, tome xvi, p. 140, 1913.

" Au sujet des Rapports entre *l'Onchocerca volvulus* et la Gale filarienne." Brumpt. Extrait du *Bulletin de la Société de Pathologie exotique*, tome xiii, No. 7, 1920.

" Contribution à l'Etude des organes reproducteurs et de la Reproduction chez les Strongles dépourvus de Capsule buccale (*Metastrongilidæ*)." Nevue-Lemaire. Extrait des *Mémoires de la Société Zoologique de France*, tome xxvii, 1917, p. 5.

" Estudio sobre la leche que se expende en Guayaquil." Andrade. Extrait, *Boletin del Laboratorio Municipal*, tomo i, No. 4, Julio de 1920.

" Recherches épidémiologiques sur la Leishmaniose forestière américaine dans l'Etat de Sao Paulo." Brumpt et Pedroso.

" Sur une Spirochétose des Poules du Sénégal produite par *Spirochæta Neveuxi* n. sp." Brumpt. Extrait du *Bulletin de la Société de Pathologie exotique*, tome ii, No. 6, 1909.

" Transmission du *Spirochæta duttoni* par *l'Ornithodorus savignyi*, et du *Spirochæta gallinarum* par *l'Ornithodorus moubata*, non transmission des Spirochètes de la Fièvre récurrente américaine et algérienne par ce même Parasite." Brumpt. Extrait

du *Bulletin de la Société de Pathologie exotique*, tome i, No. 9, 1908

"Transmission de la Piroplasmose canine tunisienne par le *Rhipicephalus sanguinesu*." Brumpt. Extrait du *Bulletin de la Société de Pathologie exotique*, tome xii, No. 10, 1919.

"Existence de la Spirochétose des Bovidés au Brésil. Transmission de cette Affection par la Tique: *Margaropus australis* (Fuller)." Brumpt. Extrait du *Bulletin de la Société de Pathologie exotique*, tome xii, No. 10, 1919.

"Transmission de la Piroplasmose canine française par le *Dermacentor reticulatus*. Embolies parasites dans les Capillaires de l'Encéphale. Brumpt. Extrait du *Bulletin de la Société de Pathologie exotique*, tome xii, No. 9, 1919.

"Note sur le Parasite des Hématies de la Taupe: *Grahamella talpæ*, n.g., n. sp." Brumpt. Extrait du *Bulletin de la Société de Pathologie exotique*, tome, iv, No. 8, 1911.

"Les Cerfs de la Forêt de Chantilly sont décimés par les Helminthes." Brumpt.

"Fixation du Plomb par les Cestodes d'Animaux saturnins." Brumpt. Extrait des *Comptes rendus des Séances de la Société de Biologie*, tome lxvi, p. 953, May, 1908.

"Le *Necator americanus* en Haute-Guinée, notes d'épidémiologie." Joyeux. Extrait du *Bulletin de la Société de Pathologie exotique*, tome v, No. 10, 1912.

"Une nouvelle Filaire pathogène parasite de l'homme (*Onchocerca cæcutiens* n. sp.)." Brumpt. Extrait du *Bulletin de la Société de Pathologie exotique*, tome xii, No. 7, 1919.

"Note sur le *Bacillus Duboscqi*, nov. sp. de l'Intestin d'un Rat africain, *Golunda campanæ* Huet, 1888." Joyeux. Extrait du *Bulletin de la Société de Pathologie exotique*, tome v, No. 9, 1912.

"Vaccination antivariolique aux Pays chauds avec de la Lymphe desséchée. Joyeux. Extrait des *Comptes rendus des Séances de la Société de Biologie*, tome lxvii, p. 624, 1909.

"Le Xénodiagnostic. Application au Diagnostic de quelques Infections parasitaires et en particulier à la Trypanosomose de Chagas." Brumpt. Extrait du *Bulletin de la Société de Pathologie exotique*, tome vii, No. 10, 1914.

"Cycle évolutif des Opalines." Brumpt. Extrait du *Bulletin de la Société de Pathologie exotique*, tome viii, No. 5, 1915.

"Etudes sur les Infusoires parasites." Brumpt. Extrait des *Archives de Parasitologie*, tome xvi, p. 187, 1913.

"A propos de *l'Hæmocystozoon brasiliense* de Franchini." Brumpt. Extrait du *Bulletin de la Société de Pathologie exotique*, tome vi, No. 6, 1913.

"Sur quelques Particularités morphologiques et physiologiques des Trypanosomes (Perte du Flagelle et Formation de Pigments divers)." Brumpt. Extrait du *Bulletin de la Société Pathologie exotique*, tome iii, No. 6, 1910.

"Sur un Infusoire nouveau Parasite du *Chimpanzé Troglodytella* (1), *abrassarti* (2), n.g., n. sp." Brumpt et Joyeux. Extrait du *Bulletin de la Société de Pathologie exotique*, tome v, No. 7, 1912.

"Globules géants ou 'corps en demi-lune' du Paludisme; autres Altérations globulaires au cours de cette Maladie infectieuse." Brumpt. Extrait du *Bulletin de la Société de Pathologie exotique*, tome i, No. 4, 1908.

"Existence de la 'Fièvre des Tiques' en Abyssinie." Brumpt. Extrait du *Bulletin de la Société de Pathologie exotique*, tome i, No 7, 1908.

"Au sujet d'un Parasite (*Rickettsia Prowazeki*) des Poux de l'Homme considéré, à tort, comme l'Agent causal du Typhus exanthématique." Brumpt. Extrait du *Bulletin de la Société de Pathologie exotique*, tome xi, No. 3, 1918.

"De l'Origine des Hémoflagellés du Sang des Vertébrés." Brumpt. Extrait des *Comptes rendus des Séances de la Société de Biologie*, tome lxiv, p. 1046, 1908.

"Importance du Cannibalisme et de la Coprophagie chez les Réduvidés hématophages (*Rhodnius triatoma*) pour la Conservation des Trypanosomes pathogènes en dehors de l'Hôte vertébré." Brumpt. Extrait du *Bulletin de la Société de Pathologie exotique*, tome vii, No. 10, 1914.

"La Myiase oculaire de l'île de Sal (Archipel du Cap Vert)." Prates. Extrait du *Bulletin de la Société de Pathologie exotique*, tome xii, No. 10, 1919.

"Sur une nouvelle Espèce de Mouche Tsé-Tsé, la *Glossina decorsei*, n. sp., provenant de l'Afrique *centrale*." Brumpt. Extrait des *Comptes rendus des Séances de la Société de Biologie*, tome lvi, p. 628, 1904.

"Contribution à l'Etude des Ixodes." Senevet. Extrait du *Bulletin de la Société de Pathologie exotique*, tome xii, No. 2, 1919.

"Le Typhus exanthématique à Porto, 1917-1919." Jorge.

"La Grippe." Jorge. 1919.

"Sur le cycle évolutif de quelques Cestodes." Joyeux. Extrait du *Bulletin de la Société de Pathologic exotique*, tome ix, No. 8, 1916.

"Hygiène militante." Jorge. 1920.

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Colonial Medical Reports.—No. 104.—Ceylon.

CEYLON MEDICAL REPORT FOR THE YEAR 1917.

By G. J. RUTHERFORD,

Principal Civil Medical Officer and Inspector-General of Hospitals.

Population.

The population of Ceylon on December 31, 1917, inclusive of immigrant coolies (but exclusive of military and shipping), was 4,632,384. Of these, 7,220 were Europeans, exclusive of those who left on war service.

Public Health.

Vital Statistics.—183,976 births were registered in the proportion of 39 per 1,000 of the population per annum, showing an increase of 9,049. The deaths registered in 1917 totalled 113,389, as compared with 120,162, a decrease in the death-rate of 6,773, in the proportion of 24 per mille. The total number of persons treated in the hospitals in 1917 was 98,134, of whom 8,734 died. At dispensaries 1,210,380 persons were treated, who paid 1,832,733 visits.

The following table shows the causation of deaths registered under the several classes of disease:—

General diseases—	
(*a*) Epidemic diseases	5,485
(*b*) Septic diseases	158
(*c*) Tuberculosis diseases	4,112
(*d*) Venereal diseases	185
(*e*) Cancer or malignant diseases	421
(*f*) Other general diseases	10,475
Diseases of the nervous system and organs of special sense	14,972
Diseases of the circulatory system	981
Diseases of the respiratory system	9,267
Diseases of the digestive system	18,828
Non-venereal diseases of genito-urinary system and annexa	823
The puerperal state	3,762
Diseases of the skin and cellular tissues ...	10,038
Diseases of bones and organs of locomotion ...	16
Malformations	10
Diseases of early infancy	7,528
Old age	3,869
Affections produced by external causes ...	2,347
Ill-defined diseases	20,112

The more notable causes of death were the following diseases:—

Infantile convulsions	12,916
Diarrhœa	10,174
Pneumonia	5,005
Rickets	4,870
Phthisis	3,768
Anæmia	3,706
Dysentery	3,059
Intestinal parasites	2,972
Anchylostomiasis and its *sequelæ* ...	2,639
Dropsy	2,586
Puerperal septicæmia	1,839
Malaria	841
Enteric fever	417
Tetanus	344
Rabies	60
Deaths attributed to pyrexia of unknown origin	15,022

Deaths due to Preventable Diseases, i.e., to diseases due to faulty sanitary conditions, overcrowding, soil infection, defective or infective water supplies, &c., amounted to 32,106. This figure does not include infantile diarrhœa or infantile convulsions, though it is probable that a large number of deaths from infantile convulsions are due to malarial infection, and a large number of cases of infantile diarrhœa to improper dieting, defective sanitary surroundings, and neglect.

Infantile Mortality.—The infantile mortality in the thirty-three principal towns during the year was at the rate of 233 per 1,000. 12,916 deaths from infantile convulsions were registered during the year, and from infantile diarrhœa 1,143. During 1917 twenty-two midwives were trained at the De Soysa Lying-in Home, Colombo. Midwives have been appointed to sixteen Government hospitals in large centres to try and decrease the infant mortality.

Vital Statistics on Estates.—The mean birth-rate on estates was 34·4 per 1,000 and the death-rate 36·4. The principal causes of death were: debility, diarrhœa, anchylostomiasis, pneumonia, dysentery, infantile convulsions, dropsy, phthisis, anæmia.

Malaria.—The incidence of the disease in any province cannot be estimated, as in the more remote districts and in districts where the population is scattered patients may not resort to medical institutions for treatment. To meet this an issue of quinine is made to Government agents and others for free distribution, both as a prophylactic and for remedial purposes before and during the periodical outbreaks. The amount of quinine distributed for these purposes during the year was 98 lb. in powder and 40 bottles of 100 pulverettes in each.

The total number treated for malaria in 1917 was 6,960 at hospitals and 341,768 at dispensaries, making a total of 348,728. There was very little epidemic malaria during the year, which accounts for a very large decrease compared with the previous year.

Plague.—There were 77 cases treated at the Infectious Diseases Hospital, Kanatta, Colombo, 58 of which proved fatal; 63 cases were of the bubonic type and 14 septicæmic, all of the latter proving fatal, while 19 of the bubonic type recovered. Five cases—all fatal—occurred at Beruwala, a township on the west coast, about thirty-five miles south of Colombo, largely inhabited by Moors. All these cases were presumably directly infected in Colombo. Two cases occurred in the Central Province: one in Kandy and one in Nawalapitiya. Here, again, the infection was from Colombo. Plague did not

occur in any of the other provinces of the island during the year under review.

Cholera.—No case of cholera was admitted to the Infectious Diseases Hospital, Colombo, in 1917, thus comparing favourably with the previous year, when forty-two cases were treated. No cholera occurred in the provinces.

Small-pox.—105 cases of this disease, with a mortality of 13, occurred in the island during the year; of the 105 cases under review, 5 were treated at the Infectious Diseases Hospital, 4 of which were landed from vessels in the harbour. One case only was indigenous, the source of infection not being evident. Ninety-eight cases with eleven deaths occurred in the Northern Province, which, since the reopening of small coastal ports and roadsteads to native craft from South India, is more exposed to infection than other parts of the island, especially in view of the difficulty or impossibility of maintaining the strict quarantine vigilance adopted in the larger ports of the island. Six separate outbreaks were due to infection directly imported from South India. It would appear that the existing precautions are inadequate to prevent the importation of this disease to the northern parts of the island, though it is not easy to see what measures can be adopted that would not press with undue severity upon the traffic and commerce between Ceylon and the Indian coast.

Vaccination.—The total number of primary vaccinations performed during the year was 125,455. Of these, 116,294 were successful, 1,956 unsuccessful, and the results not ascertainable in 7,205 cases. It is satisfactory to report that 98·48 per cent. of all primary vaccinations were successful.

The Government Vaccine Establishment has worked most satisfactorily during the year. Seed lymph, as in previous years, was obtained from the Lister Institute of Preventive Medicine, London, and the King Institute, Madras, while a certain amount was also prepared at the local institute. The lymph used is glycerinated calf lymph, and is issued for use either in glass capillary tubes or in metal collapsible tubes to stations where the daily consumption is large.

Enteric Fever.—The case incidence of this disease during 1917 was 518 with a mortality of 93. These figures, however, apply only to cases registered in the Government hospitals, and do not give any fair index of the actual prevalence of the disease in towns and rural districts generally. Another factor which obscures the statistics of this disease is the error of diagnosis not uncommon among practitioners of native medicine, who treat a considerable number of cases of "fever" without much discrimination as to type or causative agents.

Dysentery.—The number of cases of this disease treated in Government hospitals in 1917 was 2,883 with 620 deaths, and the number treated in dispensaries was 14,276. It is hoped the introduction of latrine accommodation on estates during the year will result in a reduction in the epidemics of this disease hitherto of common occurrence. This disease and many of the acute and chronic diarrhœas result from defective sanitation in and around dwellings, pollution of water supply and insect conveyance being important factors in its spread.

Leprosy.—There are two leper asylums in the island: one at Hendala, to the north of Colombo; and the other at Kalmunai, in the Eastern Province. At the Hendala Asylum there was a total of 531 inmates for the year. Of these, 24 were discharged and 78 died; with regard to those discharged, 18 absconded, 7 of whom were subsequently arrested and again interned, 3 were granted home isolation, and 3 were found to be free from manifestation of the disease. As far as the admissions to the leper asylums indicate, the disease appears to be more prevalent in the maritime districts than in the interior of the island. Home isolation (sanctioned where housing conditions are approved) was allowed in 16 cases.

Anchylostomiasis.—The total number of cases of this disease treated in the Ceylon Government hospitals during the year was 8,617, with a mortality rate of 17 per cent. Besides these cases, a large number was treated by Government medical officers on estates, and a considerable number was treated by estate dispensers. The disease appears to be most prevalent in the Central Province, and, though most common among the estate coolies, has spread to a considerable extent to villages.

The activities of the Anti-Anchylostomiasis Directors of the Rockefeller International Health Foundation continued during the year in the Matale District. Over 10,000 coolies were treated on the intensive plan; however, the fact that about three times that number of persons living in the neighbourhood of estates have not been subjected to treatment must inevitably result in a certain degree of re-infection. Considerable progress has been made in sanitation, both on estates and in villages, and the ultimate outlook is good. Campaigns against the disease were also completed in the Dikoya and Bogawantalawa districts during the year, and very satisfactory progress can be claimed, notwithstanding certain discouraging incidents and temporary setbacks, due to ignorance and prejudice on the part of the coolies, and sometimes to malicious, organized, active, or passive opposition on the part of designing persons. Patience, tact and persuasion has to some extent succeeded in overcoming local opposition. The outlook will progressively improve, it is hoped, with time, when, as the result of lessened soil pollution and regular and systematic treatment, aided by the active co-operation of planters and labourers, the difficulties now met with have become a thing of the past.

Parangi (Frambœsia, or Yaws).—The total number of cases of this disease treated in Government medical institutions during 1917 was 46,032; 853 were treated with specific remedial preparation as substitute for salvarsan, the following being those made use of: Kharsivan, arsenious iodide, arsenobenzol, or modifications and combinations of these. The administration of these remedies or combinations and modifications of the same were satisfactorily reported upon.

Cancer and Sarcoma.—The hospital and dis-

pensary statistics of these diseases in Ceylon afford unsatisfactory data as to the prevalence of the disease, as the dread of operative procedure deters many sufferers from seeking medical assistance, and those that do seek such assistance have frequently allowed the disease to progress to such an advanced stage as renders their cases inoperable. Labial and buccal epithelioma is a common form of the disease, and is probably much induced by inveterate betel chewing.

Tuberculosis of the Lung (Phthisis).—The hospital records of this disease show a total of 1,862 cases treated, with 569 deaths. Overcrowding, defective sanitation, ignorance, and neglect in the matter of ventilation are the chief predisposing causes of this scourge. Only cases in the more advanced stage seek hospital or dispensary aid, and in such cases, where the reparative powers of the patient have been much undermined, little or nothing can be done beyond the relief of urgent symptoms.

Port Health Precautions.—Eight vessels were placed in strict quarantine. Five cases of small-pox, 4 cases of chicken-pox, 9 cases of measles, and 1 case of plague were landed and sent to the Infectious Diseases Hospital. A vessel, ss. *Atlantique* (French), infected with cerebrospinal fever (spotted fever), arrived in October, and 11 suspects sent to the Infectious Diseases Hospital, while 776 Annamites in charge of 9 French officers were segregated at Ragama for observation and pending disinfection of the vessel. 113,884 persons were disinfected, and 245 persons vaccinated.

Meteorological Conditions.

The rainfall for the year was heaviest on the north-east and the south-west slopes of the hills, being specially heavy in the district east of Matale and in the Nitre Cave district, and in the south-west monsoon to the north of Ratnapura and the Ambegamuwa district. An excess over normal was experienced practically throughout the east, and a deficit to the south-west and the north. The weather conditions for the year were, on the whole, somewhat unbalanced, and resulted in spells of unseasonable weather, but no great extremes were experienced. The mean shade temperature for the island was in most months below normal, and in no month was it above normal at more than two-thirds of the stations. Unusually heavy rain set in towards the end of September and caused extensive flooding to the south-west of the island.

The Sanitary Branch of the Medical Department.

The following is a summary of the work done: 175,366 premises were inspected during the year, of which 23,702 were found insanitary, and 2,416 actual mosquito-breeding places were discovered and dealt with. There were 839 prosecutions, with 795 convictions. Prosecutions are sanctioned only after inspection by the sanitary officers, Government agents, or assistant Government agents.

Infectious Diseases.—The following infectious diseases were reported and prophylaxis carried out: dysentery, measles, chicken-pox, enteric fever, continued fever, while 225 cases of plague occurred in the island, of which 23 were outside Colombo municipal limits. There is no evidence to point to any endemic plague centre or rat epizootic existing outside of Colombo.

In the Western Province 4,531 rats were caught during the year. 1,149 were examined bacteriologically, and one was found positive for plague. This rat was caught at Beruwala on May 24; five cases of plague occurred there in May, the first one being reported on May 15. There are two possible sources of the rat infection in this instance: one from Colombo, the other from Negapatam, through the open port of Beruwala, with which it has direct communication by sea, but through which channel the infection gained entrance is not evident.

Sanitary Conveniences.—Public latrines of an approved type were constructed at Government expense in the Sanitary Board towns of Kochchikade, Henaratgoda, and Mirigama. In the Colombo District 4,791, and in the Kalutara District over 9,000 new private latrines were constructed in the rural areas.

In the Matale District 2,424 latrines were installed in the villages in connection with the anti-hookworm campaign. The sanitation of schools is receiving attention, and in the Matale District all those schools in the territories being treated for hookworm disease have been provided with sanitary conveniences at Government expense.

Hookworm Disease.—Microscopical surveys were carried out at Rayigama and Gorakapola villages; 90 per cent. were positive for hookworm. At Medapola mines in Ingiriya 500 labourers were examined, and 95 per cent. were found infected. At Cotta Church Missionary Society School 400 children were examined; all were infected. At Maggona Reformatory, where boys from all parts of the island are admitted, 471 were examined; all were infected. These were treated and re-examined, when all but eleven were found cured. Infection did not occur at the home, as it is well sanitated.

In Rayigama village arrangements were made for the treatment of the infected, but the staff had to be withdrawn after three days' work, owing to the aggressive attitude of the people brought about by the circulation of false rumours.

Specimens were collected in two isolated Cingalese villages in the North-Central Province and microscopically examined, when 70 per cent. were found to be infected with hookworm.

The General Hospital, Colombo.—This is the largest medical institution in the Colony and is divided into two sections: the paying section and the non-paying section.

As regards particular diseases, the following show their comparative prevalence and mortality figures as registered by hospital admissions:—

Acute Pneumonia.—358 cases, with 136 deaths.
Anchylostomiasis.—408 cases, with 55 deaths.
Dysentery.—222 cases, with 29 deaths.
Enteric Fever.—174 cases, with 42 deaths.

Pulmonary Phthisis.—319 cases, with 178 deaths.

Malaria.—764 cases, with 15 deaths.

Enteritis and Diarrhœa.—409 cases, with 112 deaths.

Appendicitis.—144 cases, with 4 deaths.

Accommodation.—For several years past certain wards for certain classes of cases in the pauper section have been overcrowded during the greater part of the year. As there are no poor-houses in this country a large number of aged and infirm cases have to be kept for lengthy periods in our convalescent wards, and this prevents the transfer of cases to these wards from the acute wards. Provision will have to be made to house these aged and infirm cases elsewhere, or we shall have to increase our accommodation. Occasionally cases have to be refused admission or delayed when seeking admission to the paying wards, but when circumstances permit of the opening of the new ward now approaching completion, the accommodation for paying patients should suffice for several years to come.

A large amount of useful work was done by the inmates of the Colombo Lunatic Asylum, the males being employed in carpentry, manufacture of string rugs and mats from coir, repairs to furniture, basket-making, rattanning of cots and chairs, &c.; and the females, besides engaging in the coir industries, employed their time in sewing and tailoring work for the General Hospital, the Eye Hospital, the Lady Havelock Hospital, and also contributed their handiwork to the Queen Mary's Needlework Guild. Great credit is due to the matron for her supervision of the needlework. The foundations for the new asylum at Angoda on the Colombo-Avissawella road were commenced during the year.

The Infectious Diseases Hospital.—864 cases were treated in this hospital, with 67 deaths. The following table is instructive:—

	1917	
	Number treated	Deaths
Small-pox	5 ...	2
Cholera	— ...	—
Plague	77 ...	58
Diphtheria	7 ...	2
Chicken-pox	506 ...	—
Measles	157 ...	1
Mumps	22 ...	—
Pneumonia	5	2
Acute diarrhœa	5 ...	—
Other diseases	58 ...	—

The De Soysa Lying-in Home.—The institution continues to be useful for purposes of instruction to pupils in midwifery. I am of opinion that the infant mortality of the island, particularly on the estates, could be appreciably reduced if modern methods and precautions could be more generally adopted.

The King Edward VII Tuberculosis Institute, the Ragama Tuberculosis Hospital, and the Kandana Sanatorium for Consumptives.—These institutions now provide for the medical treatment and cure of tuberculous patients. The Colombo institution, under the care of an officer who has specialized in the disease, is being increasingly patronized. 1,331 new cases of phthisis of the lung were admitted; 290 were sent for indoor treatment at Ragama; 459 cases of more or less advanced tuberculosis of the lung were treated at the Ragama hospital with a mortality of 100.

The Kandana Anti-Tuberculosis Sanatorium.—This institution and buildings cover forty acres of land. The site is an excellent one, on high ground, with a dry porous soil, on the Colombo-Jaela road, and near the railway station. The building consists of four wards with half walls, designed to accommodate fifty patients. There are suitable quarters for resident medical officers, nurses and staff, with ample grounds for recreation, gardening and open-air pursuits. I am confident that the public-spirited donor, Mr. A. E. de Silva, has conferred a great and lasting benefit on the people of the country, and greatly deplore his untimely demise, which has denied him the satisfaction of seeing the completion of the good work.

The Bacteriological Institute, Colombo.—The constructing and equipping of a Pasteur Institute for the treatment of persons bitten by rabid dogs is being taken in hand.

Medical Aid to Immigrant Coolies.

The health precautions and medical care of immigrants commences on the Indian coast at Tataparai and Mandapam, and continues in the medical inspection at Talaimannar and at the Colombo Wharf Depot, and consists in internment of infectious cases, contacts, or suspects at Tataparai, Talaimannar, or Ragama, and medical care of all cases of illness. The different immigration depots are manned by officers of the Medical Department. The new Immigration Camp and Quarantine Depot at Mandapam was opened on May 1, 1917, replacing the temporary camp that had previously existed. The medical and sanitary provisions are excellent. Water supply, sewage disposal, hospital disinfection and housing has received careful attention, and ample provision has been made for all requirements and contingencies, and for the safety and comfort of travelling immigrants.

Government District Hospitals in Planting Areas.—There are fifty such hospitals, staffed by efficient and fully qualified medical officers, nurses, and attendants, and equipped with modern requirements. Each such hospital has an out-patient dispensary attached. The medical officers, besides attending to their hospitals and dispensaries, pay domiciliary visits to coolies in their lines when summoned by the superintendents of estates.

Estate (Rebate) Hospitals.—Fifty-eight estates have established hospitals for the better treatment, dieting, and medical care of the sick. Such hospitals entitle the estate to a rebate on export tax, in proportion to the efficiency of the medical and sanitary provision made. A sum of Rs. 50,880 was refunded to estates during the year as rebate under the above system. It is satisfactory to report that progressive improvement is evident in many of these hospitals, some indeed having achieved a high degree of efficiency.

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A system of medical instruction, in the form of lectures, demonstrations, and practical clinical work at Government hospitals in the planting districts was introduced during the year. These lectures, &c., were given by the district medical officers, and at the termination of the course a written and oral examination was held by the provincial surgeons. The number of candidates presented for instruction was 360. Of these 281 presented themselves for examination; 155 satisfied the examiners, and 126 failed to do so. Those who did not present themselves for instruction and examination will be called upon to do so at a subsequent course of instruction, which those who failed will also be required to attend.

Latrines.—A rule was promulgated making it incumbent on every estate to provide latrine accommodation for all employees within one year from the date. The type of such latrine was subject to approval, one compartment being provided for every fifteen employees, two children being computed as one adult. Type plans of latrines on the pit and the pail system were furnished by the senior sanitary officer. It is satisfactory to report that 1,156 estates have complied with the requirements.

Sanitary Inspection of Estates.—The systematic and methodical sanitary inspection of estates in the Western, Central and Southern Provinces was commenced during the year, two specially selected senior officers of the Medical Department being delegated for these duties. A report on the vital statistics, site and construction of lines, drainage, water supply, scavenging, latrine accommodation, sanitary state of surroundings, and medical provisions, if any, is made by these officers through the senior sanitary officer. The latter officer takes such action as may be indicated if the sanitary conditions are defective. The reports of the inspecting medical officers would serve to indicate that, while the coolie has no actual objection to the use of the latrines provided, there remains on many estates a tendency to revert to insanitary customs of the past. Nothing short of regular and systematic inspection of the surroundings of coolie lines by the superintendents or by persons appointed by him and the admonishment or punishment of offenders will check this tendency. It is gratifying to note that among superintendents of estates there is a growing sense of responsibility as regards the health of their labour force. Greater knowledge of the preventability of a large amount of sickness and death among coolies is, I trust, resulting in greater care. It is regrettable that on many estates, especially in the older districts, the present-day manager has to contend with an inheritance of ill-constructed lines on unsuitable sites, with defective drainage and faulty water supply, in addition to the soil pollution that has existed for many years past. The financial stringency resulting from war conditions and the paucity of assistants further hamper the efforts of managers in the direction of sanitary improvements.

One of the inspecting officers reports that on second or subsequent visits paid to estates on which he originally found sanitary conditions much neglected there was evidence of a marked and sustained effort to remedy evils previously indicated; this shows that planters are showing an encouraging interest in sanitary reform. I am hopeful that with the co-operation of estate managers and estate agencies this will eventually result in a substantial reduction in sickness and deaths due to preventable disease on estates.

Colonial Medical Reports.—No. 105.—Calcutta.

REPORT OF THE HEALTH OFFICER OF CALCUTTA FOR THE YEAR 1917.

By H. M. CRAKE, M.D., D.P.H.,
Fellow of the Royal Institution of Public Health.

Meteorology and Vital Statistics.

Climatic Conditions.

The meteorological records for 1917 show that the weather conditions throughout the year were fairly normal in character. This is in marked contrast to 1916 which with its prolonged high temperature in the hot season and its heavy rainfall, which continued till late in the year, was distinctly abnormal. The maximum temperature curve shows a rapid rise from between 75-80° F. in January to over 95° F. in April. A more gradual fall then occurred during May and June, the temperature falling to 90° F. During July and September the temperature remained fairly constant between 85-95° F. A rapid drop then occurred in November, bringing the temperature down to below 80° F. in December. The highest maximum temperature recorded, 96·9° F., occurred in April, and the lowest, 76·4° F., in December. The minimal temperature follows the curve of the maximal at a lower level, being about 10° F. lower during the rains, i.e., from June to October, and about 20° F. lower during the remainder of the year. It is rather striking to find that the nights are 20° F. cooler than the day during the hot weather as well as in the coolest

Return of Diseases and Deaths in 1917 by the Health Officer of Calcutta.

GENERAL DISEASES.

	Deaths
Alcoholism	2
Anæmia	59
Anthrax	—
Beriberi	2
Bilharziosis	—
Blackwater Fever	—
Chicken-pox	—
Cholera	866
Choleraic Diarrhœa	—
Congenital Malformation	—
Debility	—
Delirium Tremens	—
Dengue	—
Diabetes Mellitus	79
Diabetes Insipidus	—
Diphtheria	32
Dysentery	1,707
Enteric Fever	209
Erysipelas	19
Febricula	—
Filariasis	—
Gonorrhœa	2
Gout	—
Hydrophobia	3
Influenza	—
Kala-Azar	86
Leprosy	88
(*a*) Nodular	—
(*b*) Anæsthetic	—
(*c*) Mixed	—
Malarial Fever—	984
(*a*) Intermittent	—
Quotidian	—
Tertian	—
Quartan	—
Irregular	—
Type undiagnosed	1,484
(*b*) Remittent	—
(*c*) Pernicious	—
(*d*) Malarial Cachexia	—
Malta Fever	—
Measles	138
Mumps	—
New Growths—	—
Non-malignant	—
Malignant	60
Old Age	1,537
Other Diseases	1,319
Pellagra	—
Plague	81
Pyæmia	—
Rachitis	—
Rheumatic Fever	7
Rheumatism	56
Rheumatoid Arthritis	—
Scarlet Fever	—
Scurvy	—
Septicæmia	70
Sleeping Sickness	—
Sloughing Phagedæna	—
Small-pox	28
Syphilis	45
(*a*) Primary	—
(*b*) Secondary	—
(*c*) Tertiary	—
(*d*) Congenital	—
Tetanus	873
Trypanosoma Fever	—
Tubercle—	—
(*a*) Phthisis Pulmonalis	1,432
(*b*) Tuberculosis of Glands	—
(*c*) Lupus	—
General Diseases—*continued.*	Deaths
(*d*) Tabes Mesenterica	—
(*e*) Tuberculous Disease of Bones	—
Other Tubercular Diseases	106
Varicella	—
Whooping-cough	—
Yaws	—
Yellow Fever	—

LOCAL DISEASES.

Diseases of the—	
Cellular Tissue	98
Circulatory System	—
(*a*) Valvular Disease of Heart	449
(*b*) Other Diseases	141
Digestive System—	—
(*a*) Diarrhœa	744
(*b*) Hill Diarrhœa	—
(*c*) Hepatitis	—
Congestion of Liver	—
(*d*) Abscess of Liver	45
(*e*) Tropical Liver	—
(*f*) Jaundice, Catarrhal	—
(*g*) Cirrhosis of Liver	124
(*h*) Acute Yellow Atrophy	—
(*i*) Sprue	—
(*j*) Other Diseases	1,038
Ear	—
Eye	—
Generative System—	—
Male Organs	15
Female Organs	60
Lymphatic System	3
Mental Diseases	—
Nervous System	466
Nose	—
Organs of Locomotion	2
Respiratory System	4,764
Skin—	134
(*a*) Scabies	—
(*b*) Ringworm	—
(*c*) Tinea Imbricata	—
(*d*) Favus	—
(*e*) Eczema	—
(*f*) Other Diseases	—
Urinary System	323
Injuries, General, Local—	—
(*a*) Siriasis (Heatstroke)	—
(*b*) Sunstroke (Heat Prostration)	—
(*c*) Other Injuries	97
Parasites—	1
Ascaris lumbricoides	—
Oxyuris vermicularis	—
Dochmius duodenalis, or Ankylostoma duodenale	—
Filaria medinensis (Guinea-worm)	—
Tape-worm	—
Poisons—	—
Snake-bites	—
Corrosive Acids	—
Metallic Poisons	—
Vegetable Alkaloids	—
Nature Unknown	—
Other Poisons	11
Surgical Operations—	—
Amputations, Major	—
,, Minor	—
Other Operations	—
Eye	—
(*a*) Cataract	—
(*b*) Iridectomy	—
(*c*) Other Eye Operations	—

month of the year. The mean daily range varied from 9·1° F. in July and August to 22·5° F. in January. The moisture-laden atmosphere of the rains tends to interfere with the radiation of heat from the earth just as it interferes with radiation from one's body. The result is a capital representation of a Turkish bath.

The total rainfall for the year was 70·68 inches. This is slightly above the average but considerably less than in 1916, when 82·78 inches of rain were recorded. The most remarkable feature of the rains of 1917 was that although we had six solid months of rain, from May to October inclusive, the rainfall was so uniformly disturbed and so moderate that the early onset and late cessation did not result in any abnormal downpour. There were only two months, January and December, in which no rain fell. From February to April about 4·5 inches fell. In May 8·22 inches were recorded, followed by 11·6 inches in June and 12·1 inches in July. The wettest month was August with 14·27 inches. A temporary lull in September, when only 8·09 inches were recorded, was followed by a wet October with 11·31 inches. The largest rainfall recorded in twenty-four hours was 4·14 inches. This occurred in August. The contrast with 1916 is very marked. In that year a prolonged drought was followed by a very wet June. Then a "break" occurred in July followed by heavy rains lasting from August to October.

The barometer was higher than usual in May, otherwise the readings followed the usual curve, being highest in the cold weather and lowest during the rains. The prevailing direction of the wind was north-west in January, February, November and December; south-west from March to July; south east from August to October. From June to August it was almost due south.

Vital Statistics.

Death-rates.

The total number of deaths registered during the year was 21,360, equivalent to a death-rate of 23·8 per mille calculated on the census population of 1911. *This is the lowest death-rate ever recorded in Calcutta.* Calculated on the mean population for the year, which is estimated at 927,610, the death-rate in 1917 was only 23 per mille. As there is no "natural increase" of population in Calcutta the number of deaths exceeding the number of births by about 2,500 or more every year, the increase in the population which undoubtedly occurs, as the Census returns show, is entirely due to immigration. The extent and volume of this constant stream of immigrants is shown by the following figures. During the ten years inter-censual period 1901 to 1911, there were 295,733 deaths and 150,099 births registered in Calcutta, i.e., the excess of deaths over births was 145,634. And yet the population, according to the census of 1911, had increased by 48,271. That is to say, 193,905 immigrants, or an average of 19,390 per annum, had migrated from the country and settled in the city. These figures give some idea of the difficulties encountered in administering sanitary regulations relating to registration of births, vaccination, the control of epidemics, &c. As I have previously pointed out, "crude" death-rates, such as those given above, i.e., without corrections on account of variations in the constitution of the population, particularly as regards age and sex, are useless for purposes of comparison with other cities. They are, of course, of the greatest value for ascertaining the state of the public health in Calcutta compared with previous years. Although the "factor of correction" calculated by the Registrar-General in England is not available here, nor have death-rates for each age and sex group in a "standard million" been worked out, an attempt may be made to work out a partially corrected death-rate in the following manner. The actual death-rates in Calcutta amongst each age group are calculated for both sexes. From the census the normal proportion of each age and sex group in Bengal is ascertained and the population of Calcutta is redistributed amongst the various age and sex groups according to the normal distribution in Bengal. The number of deaths in each group is then calculated from the actual death-rates recorded in Calcutta. The result is a death-rate which approximately represents the death-rate of Calcutta if the age and sex distribution of the population was exactly the same as in Bengal.

Principal Variation in Mortality from Different Causes.—The principal infectious diseases—plague, cholera and small-pox—caused only 975 deaths. One has to go back twenty years, to the time when plague was unknown in Calcutta, to find a figure comparable to this. The most remarkable diminution has occurred in the mortality from cholera, which only caused 866 deaths. This is the lowest figure ever recorded in Calcutta with the exception of 1898, when only 665 deaths were recorded. This remarkable figure was followed by two severe epidemics which caused 3,449 deaths in 1896 and 2,349 deaths in 1897.

The number of deaths from plague was only 81. This is the second year in succession that there has been no epidemic of plague. During the preceding four years the mortality from plague fell rapidly. Each succeeding year the mortality was less than half that of the previous year. The mortality from small-pox was almost negligible, only 28 deaths being recorded.

The remarkable diminution in the mortality from tuberculosis is most satisfactory, particularly as there has been a steady and uninterrupted fall in the number of deaths during the last four years.

Death-rates amongst Males and Females.

In spite of the improvement in the general death-rate of the city, the death-rate amongst females is still more than 40 per cent. higher than amongst males. The actual death-rates in 1917 were: males, 19·8 per mille; females, 32·1 per mille. This in-

version of the usual ratio between male and female death-rates is a remarkable feature of the vital statistics of the city. Until it is realized that the strict observance of the purdah system in a large city, except in the case of the very wealthy who can afford spacious homes standing in their own grounds, necessarily involves the premature death of a large number of women, this standing reproach to the city will never be removed. Although the ratio between the two death-rates is practically unchanged the death-rate amongst females has shared in the improvement of the general death-rate.

Death-rates among Different Classes.—The principal communities forming the population of Calcutta has been slightly modified. The Christian community has been sub-divided into non-Asiatic (including Anglo-Indian) and Indian; the former heading "Christian," which included Asiatics and non-Asiatics, was obviously useless for statistical purposes. On the other hand, "Buddhists" and "other classes," both comprising a very small section of the population, have been amalgamated.

Seasonal Variations in the Death-Rate.—In the Tropics the sharply defined seasons, with their marked variation in temperature and rainfall, exert a very powerful influence on the public health. In large cities, such as Calcutta, with a large excess of adult males, a considerable number of whom are primarily agriculturists, who come down to Calcutta and after working for several months return to their country to till the ground and reap the crops, allowance must be made for the ebb and flow of the labouring classes in dealing with fluctuation in the death-rate. Making every allowance for this well-known feature of city life in India, it certainly cannot account for the extremely marked and regular variation in the death-rate at different seasons of the year. That these are absolutely independent of the movements of the labouring classes is clearly shown by the fact that precisely similar fluctuations occur amongst the female population of the city which, of course, is comparatively stable.

Mortality at Different Ages.—The infantile mortality rate was 239 per mille. In three years the infantile mortality rate has been lowered by one-sixth. If this continues, another half a dozen years will see the rate reduced to half that recorded in 1915. As I have previously pointed out, the infantile mortality rate, unlike all other mortality rates, is calculated on a purely hypothetical population, which is assumed to be equal to the number of births registered during the year. Obviously any defect in registration diminishes the population on which the rate is calculated and automatically increases the infantile mortality rate, and vice-versa.

Death-rates amongst Males at Different Age-Periods.—The death-rate amongst males of all ages was 19·8 per mille, as compared with 20·5 in 1916. Both these rates are a marked improvement on the quinquennial average of 23·3 per mille.

With the exception of the age period 50-60 years, which had an increased mortality rate, the mortality rates at other age periods show an all-round improvement. It is satisfactory to note the relatively marked improvement in the death-rate amongst children over 1 and under 5 years of age. As in previous years, the age-group 10-15 years had the lowest death-rate, 6·6 per mille, and the age-group 60 years and over the highest, viz., 95·2 per mille.

The most remarkable feature is the manner in which is demonstrated the profound influence the abnormal constitution of the population has on the vital statistics of the city. Not only do males form over two-thirds of the population, but more than half of them belong to the age-groups 20-30 years and 30-40 years, i.e., are in the prime of life. The death-rates for these two age periods were 8·1 per mille and 11·4 per mille respectively. As I have shown elsewhere, were it not for this excess of young adult males the general mortality rate would undoubtedly be considerably higher.

Death-rate amongst Females at Different Age Periods.—The abnormal inversion of the ratio between the mortality rates amongst males and females, which is one of the saddest features of the vital statistics of the city, still continues. The death-rates amongst females of all ages was 32·1 per mille, as compared with 19·8 per mille amongst males. The difference, 12·3 per mille, is equivalent to 60 per cent. of the male death-rate. In other words, for every three deaths amongst males, five deaths occur amongst females.

With the exception of a slight increase amongst children under 10 years and women of 50-60 years of age, there has been an all round improvement in the mortality rates amongst females. Under 10 years of age the death-rate is almost the same for girls as for boys.

Similarly between 40 and 60 years the rates are very similar. At 10-15 years of age the death-rate amongst females is 25 per cent. higher than amongst males, whilst at age-periods 15-20 years, 20-30 years and 30-40 years it is actually more than double. That is to say, the whole of the excess mortality amongst females occurs amongst young women in the prime of life.

The following comparative statement shows the death-rates per mille amongst males and females of the principal diseases in which the rate amongst females was markedly higher than amongst males:—

Disease	Mortality rate amongst males	Mortality rate amongst females
Fever*	1·6	2·0
Dysentery	1·5	2·6
Tuberculosis	1·3	2·5
Malaria	0·87	1·5
Senility	0·92	3·3
Diarrhœa and enteritis† ...	0·60	1·3
Bronchitis and Broncho-pneumonia	3·2	5·3
Paralysis	0·26	0·41
Suicide	0·04	0·07
Burning	0·04	0·24
Drowning	0·04	0·07

* Excluding puerperal fever.
† Excluding puerperal diarrhœa.

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The principal cause of these high rates of mortality is undoubtedly the observance of the purdah system in a great city where there are great masses of insanitary dwellings crowded together in the slum areas. The heavy mortality from respiratory diseases and tuberculosis amongst women is clear proof of the deadly effect of depriving them of fresh air and light, by confining them in the zenana, which, as I have repeatedly pointed out, is always the most insanitary part of the house. The women's apartments are always the inner apartments, and being constructed with the sole object of securing privacy, adequate lighting and ventilation are secondary considerations. Constant exposure to insanitary environments must lower the power of resistance to infection, and this probably accounts for the heavy mortality from such diseases as malaria, dysentery, &c. Social and economic conditions, such as poverty, overcrowding, child-marriage, particularly the latter, which subjects young and undeveloped girls to the strain of repeated pregnancies and prolonged lactation, all play an important part in raising the death-rate amongst women.

Infantile Mortality.

Principal Causes of Deaths amongst Infants.—The total number of deaths amongst infants was 4,499. Of these, 1,674, or 37 per cent., occurred during the first week. The principal causes of mortality were premature birth and congenital debility, which caused three out of four deaths (1,282 deaths out of 1,674), and tetanus neonatorum, which caused 312 deaths. The latter is an entirely preventable disease due to dirty midwifery, and, as I have repeatedly urged, it is high time that the Indian *dhai* was prevented by law from causing the death of so many babies. As this disease has an incubation period of from three to ten days, it causes even greater mortality amongst babies from 7 days to 1 month old.

The heavy mortality from respiratory diseases is largely due to exposure. In Calcutta the children of the poorer classes are very inadequately clothed.

Diarrhœal diseases are responsible for a comparatively small number of deaths, due to the fact that the great majority of babies are breast-fed.

The very high mortality from premature birth and congenital debility points unmistakably to something radically wrong with the conditions under which expectant women have to live. The principal factors concerned are (*a*) poverty with its necessary corollaries, underfeeding and anæmia; (*b*) constant exposure to insanitary surroundings, particularly want of fresh air, intensified by the purdah system; (*c*) child marriages, immature girls being subjected to the strain of repeated pregnancies and prolonged periods of lactation.

Birth-rate.

The number of births registered in Calcutta during the year was 18,807. The birth-rate for 1917 calculated on the total population was 20·9 per mille. Owing to the exceptional constitution of the population this obviously conveys a wrong impression. The birth-rate calculated on the total female population was 65 per mille. Even this birth-rate, however, is of little use as an index of the fertility of the women of Calcutta, as it includes a large number of women who are not of child-bearing ages, and others, such as widows and prostitutes, who should obviously be excluded. Excluding these classes, the number of married women of child-bearing age is approximately 100,000, and the birth-rate amongst this group of women was 188 per mille.

Principal Causes of Deaths.

General Prevalence of Infectious Diseases.

Plague has almost vanished from the vital statistics. Only 81 deaths were recorded during the year.

Cholera, the mortality from which was only 866, as compared with 1,335 in 1916 and a quinquennial average of 1,787, shows a most remarkable diminution. There has been nothing approaching this figure in the vital statistics of the city for twenty years past.

There were only twenty-eight deaths from small-pox. This, I hope, indicates that a series of non-epidemic years will intervene before it again assumes epidemic form. "Fever," including malaria and enteric, caused 2,925 deaths, a slight increase compared with 1916 when 2,887 deaths were recorded. The increase is due to deaths from "other fevers," both malaria and enteric showing a decrease.

Dysentery and diarrhœa (including enteritis and puerperal diseases) accounted for 2,577 deaths, or 2·9 per mille, as compared with 2,487, or 2·8 per mille, in 1916.

Tuberculosis shows a further decline, from 1,738 deaths in 1916 to 1,539. During the last five years the mortality from tuberculosis has fallen from 2,196 in 1913 to 1,539 in 1917, a *decrease of nearly 30 per cent.*

Measles, unfortunately, appears to have departed from the three-year cycle which has prevailed since 1910. There were 138 deaths in 1917 as compared with 191 in 1916 (an epidemic year following two non-epidemic years).

The total number of inoculations for plague done during the year was sixteen, and so far as is known no deaths occurred among persons who had been inoculated. The campaign against rats was continued during the first eight months of the year. About 65,000 rodents were destroyed and a little over Rs. 1,000 was paid by way of reward. The campaign was considered futile and with the approval of the Corporation was abandoned with effect from September 1, 1917.

The number of deaths from cholera was 866, or 0·96 per mille, the lowest figure recorded in Calcutta since 1898. During the last four years the mortality from cholera has fallen from 1,983 in 1914 to 866 in 1917, a reduction of over 50 per cent.

Age, Sex and Class Incidence.

As in previous years, Hindus suffered far more severely than Mohammedans. Out of a total of 866 deaths there were 767, or 1·2 per mille, amongst Hindus and only 93, or 0·3 per mille, amongst Mohammedans. Only six deaths occurred amongst non-Asiatics and Indian Christians. These figures corroborate in a very striking manner the statement that the bulk of the cholera in Calcutta is waterborne as the Hindu community regards the water of Tolly's Nullah and the river as sacred and bathing is a religious ceremony frequently performed.

The incidence amongst females was slightly less than amongst males. This is unusual as the two sexes are usually attacked in almost exactly the same proportions.

Young children and adults over 50 suffered nearly twice as severely as adults in the prime of life.

There were only twenty-eight deaths recorded as due to small-pox. At the time of writing a local outbreak of considerable intensity has broken out in Jorasanko and Barrabazar. The outbreak commenced in March—an unprecedented occurrence in Calcutta, and the majority of the early cases were unprotected recent arrivals in Calcutta. An inspection of Barrabazar showed that there had been a great influx of people from plague-stricken areas up-country, particularly Rajputana. I have every hope that there will be no general epidemic this year.

Measles.

The number of deaths from measles was 138, or 0·15 per mille. From 1910 to 1916 measles followed a definite cycle, an epidemic year being followed by two non-epidemic years. This year it appears to have reverted to its former type with irregular fluctuations from year to year. The disease was most prevalent in March, April and May, over 50 per cent. of the deaths occurring in these months.

Hindus appear to be much more susceptible than Mohammedans, and females are attacked slightly more frequently than males.

The number of deaths recorded as due to enteric was 209, or 0·23 per mille, this represents a marked improvement.

Ages, Sex and Caste Incidence.—Males and females appear to be about equally susceptible. Children and young adults are much more susceptible than older persons.

The incidence amongst the different communities varies enormously. The 209 deaths recorded as due to enteric were distributed as follows: Hindus, 172, or 0·28 per mille; Mohammedans, 12, or 0·04 per mille; non-Asiatics (including Anglo-Indians), 16, or 0·57 per mille; and Indian Christians, 8, or 0·67 per mille.

Non-Asiatics and Indian Christians appear to be more susceptible than either Hindus or Mohammedans. The most striking feature, however, is the comparative immunity of Mohammedans, the attack ratio amongst this community being only one-seventh of that amongst Hindus. A good deal of this immunity is probably more apparent than real, a number of untreated and therefore undiagnosed cases occurring amongst the ignorant poorer classes.

Local Outbreak.

A local outbreak occurred in the Loreto Convent, Entally.

The epidemic proper lasted from July 30 to August 31. Not a single case occurred amongst the seventy-four infants and younger children in the nursery.

Nearly half the total number of cases were infected during the week ending August 12, 1917. There were only two deaths.

The chief defect was found to be the extremely inadequate supply of filtered water in the orphanage and also in the boarding school, particularly in the former.

The blood of the men in charge of the main kitchen and of eight cooks employed there, and of two cooks in the Bengali school kitchen, was examined for "carriers." All gave negative Widal reactions with the exception of two cooks from the main kitchen. These men were sent to the laboratory and fuller tests made. The Mother Superior was warned and advised to exclude both men from the Convent.

It seems clear that "carriers" play a very important part in the spread of enteric in Calcutta. Perhaps the most important factor, however, is the number of cases—many unrecognized and untreated—which are allowed to remain in their houses without skilled nursing. This means endless opportunities for the spread of the disease through discharges, soiled linen, utensils, &c., not being disinfected.

The total number of deaths recorded as due to malaria was 984, or 1·1 per mille. From this it is clear that the apparent reduction in malaria is almost entirely due to the practice adopted of registering deaths which were formerly ascribed to malaria, as due to "other fevers."

Age, Sex and Caste Incidence.—Mohammedans suffered much more severely than Hindus, the mortality rates per mille being 1·8 and 0·83 respectively. This is largely due to the fact that the suburban wards with high fever rates contain a relatively large Mohammedan population.

The mortality rate amongst the females was 1·5 per mille as compared with 0·87 amongst males.

The age incidence shows that children and young adults are more susceptible than the later age-group.

Dysentery and Diarrhœa.—The total number of deaths from these causes was 2,577, or 2·9 per mille. The increased mortality is mainly due to diarrhœa and enteritis, the deaths from dysentery showing a relatively small increase.

Age, Sex and Class Incidence.—Hindus, with a mortality rate of 3·2 per mille, suffered more severely than Mohammedans amongst whom the

death-rate was 2·2 per mille. Amongst "other classes" it was slightly less, 1·9 per mille.

Females suffered twice as severely as males, the death-rates per mille being 4·3 and 2·1 per mille respectively.

A further marked decline in the mortality from tuberculosis occurred this year, the total number of deaths recorded being 1,539, or 1·7 per mille. A most remarkable reduction in the death-rate from tuberculosis has occurred during the last five years. *It is actually nearly* 30 *per cent. lower than it was five years ago.* Of the 1,539 deaths recorded as due to tuberculosis 1,433 were due to pulmonary tuberculosis and 106 to tuberculosis of other organs.

One common factor appears to be insanitary housing conditions. Whether it is a dark ill-ventilated room in a hut, in the suburbs, or a gloomy stuffy den in the slums, the results are identical. Given thousands of cases of tuberculosis, spitting promiscuously and crowded together under insanitary conditions, tuberculosis is bound to play havoc, particularly when so many of its victims are predisposed to infection by under-feeding, and the struggle for existence under depressing conditions.

Age, Sex and Caste Incidence.—Hindus and Mohammedans appear to be about equally susceptible, the mortality rates being 1·7 and 1·6 per mille. The death-rate amongst "other classes" was slightly higher being 1·9 per mille. Females suffered nearly twice as severely as males. As I have repeatedly pointed out, I am convinced that the observance of the purdah system in a large city is very largely responsible. The consequence is that women rarely escape from their insanitary "inner apartments" which are usually the most ill-lighted and ventilated in the house as privacy must be secured at all costs. The following statement showing the incidence at different age periods reveals the saddest feature of tuberculosis in Calcutta, the heavy toll taken by tuberculosis amongst young females.

The number of deaths from respiratory diseases (excluding pulmonary tubercle) was 4,769, or 5·3 per mille. Although the returns have been stationary for the last two years, a marked diminution in the mortality from these diseases has occurred since 1913, when 5,310 deaths were recorded.

Seasonal Prevalence.—This is extremely marked by an almost uninterrupted rise and fall with its minimum in July and its maximum in January. As the returns for December are almost identical with those for January, the curve is almost symmetrical, the steady fall from January-July being followed by a steady rise from July-December.

Age Incidence.—As already pointed out in dealing with infantile mortality, acute bronchitis is one of the principal causes of deaths amongst infants.

Out of 1,917 deaths from acute bronchitis 1,354 occurred amongst infants. With the exception of twenty-seven deaths amongst older children, the whole of the remaining deaths occurred amongst children 1 to 5 years of age.

Out of 1,293 deaths from chronic bronchitis 826, or 63 per cent., occurred amongst old people 60 years of age and over.

Pneumonia.—This appears to be a disease of adult life. Out of 1,128 deaths recorded as due to pneumonia, 66 per cent. occurred between the ages of 20 and 50 years. The mortality rate rapidly rises with advancing years.

Broncho-pneumonia is particularly prevalent amongst children, nearly 50 per cent. of the total deaths occurring amongst infants and children under 5 years of age.

Work of the Sanitary Department.

The following statement shows the principal improvements effected and in progress:—

	1917
Provision of new house drains	222
Improvements to existing drains	4,361
Provision of connected privies	608
Cleansing and enclosing open lands	487
Improvement of insanitary buildings	67
Filling-up wells	123
Filling-up tanks	214
Improvement of cow-sheds, cattle-sheds and stables ...	82
Improvement of food shops	1,418
Removal of jungle	280
Miscellaneous	844
Total	8,706

Improvement of Insanitary Buildings.

In drawing up requisitions for improvements, the object aimed at is the provision, so far as may be practicable, of some open space or spaces at the back or on the sides, and the following methods have been adopted to improve the buildings in question:—

(1) *Provision of Back Space.*—By the demolition of the ill-ventilated back block, and by providing windows in the back wall facing the open land of the adjoining premises belonging to another owner by making the party pay compensation.

(2) *Provision of Side Spaces.*—By the demolition of some ill-ventilated rooms entirely or partially.

(3) *By the enlargement of the central courtyard* —as in 33, 40, 41, 42, 43, 44/1, 50, 53, 54, 54/1, 56 and 57, 63/2/1, 63/3, 63/5 and 33/2, Mallanga Lane; 2, 8 (four huts), Abhay Haldar Lane; 3, 5, 11, 10, 18, Madan Boral Lane; 4/1, Lal Behari Thakur Lane; 16, Sreenath Das Lane.

(4) *By the demolition of the middle room of an ill-ventilated range.*

(5) *By the re-arrangement of the courtyard and the rooms in a block of buildings.*

(6) *By opening sky-lights or ventilators over one-storied ill-ventilated rooms.*

In some of the worst cases the owners have on receipt of notice erected altogether new sanitary masonry buildings. In other cases the owners have been granted concessions and allowed to erect a second storey over one-storied rooms on the road-side, the building regulations being relaxed.

The revised by-laws relating to cattle-sheds, &c., have not yet been sanctioned by Government, but their requirements have been kept in view and closely followed in enforcing improvements.

Improvement of Aerated Water Factories.—By the direction of the Markets Special Committee all these places have been regularly inspected and action has been taken to rectify defects, the principal improvements enforced being the paving of floor, the provision of proper drainage, lime washing and general cleanliness and an adequate supply of filtered water with arrangements for two or three changes of water for cleansing bottles.

Improvement of Grog Shops.—All the grog shops in the city were inspected by the Health Department during the year. Sixty-one were reported upon.

Improvement of Bakeries.—All the bakeries in the city were inspected and reported upon during the year, the total number dealt with being 214. About half were found situated in huts with kutcha walls, and twenty-five bakeries were in objectionable surroundings, i.e., near stables, dustbins, service privies, &c. The lighting and ventilation were either altogether bad or deficient. There is no denying the fact that a large proportion of the bakeries are in a very insanitary condition.

Improvement of Markets.—Towards the end of the year, directions were issued to the district health officers to make a detailed inspection of all the private markets and to submit a comprehensive report in regard to their present sanitary condition and the improvements required.

During the year an application was received for sanction to establish a market. A site was selected and was generally approved by the Markets Special Committee who however postponed formal approval until the building plans were submitted.

Food Inspection.—It had long been recognized that the provisions of the Calcutta Municipal Act of 1899 relating to foodstuffs were very defective. During the year under report, however, complaints in regard to the sale of adulterated ghee became so acute that immediate legislation was found necessary. There was a widespread belief that much of the ghee sold in Calcutta was mixed with animal fat. The Marwaris, whose religious susceptibilities were hurt, took up the matter, and besides putting social pressure upon dealers of their own community who had been selling adulterated ghee, pressed Government to take drastic action. This Act came into force on September 13, 1917. The principal provisions of the new law are the definition of adulterated ghee, prohibition of the sale, &c., of impure ghee, and of any article similar to ghee under a name resembling the name given to any brand of ghee, it being left to the court to presume, unless and until the contrary is proved, that any ghee found in the possession of a person who is in the habit of manufacturing or storing ghee has been manufactured or stored for sale. The prohibition of the keeping of adulterants in places where ghee is manufactured or stored, power to seize unwholesome ghee found in godowns or in course of transit, and higher penalties for offences. A special committee of the Corporation considered the measures to be adopted to enforce the provisions of the new law, and on their recommendation two extra analysts and a special food inspector to deal exclusively with wholesale and big retail vendors were appointed.

Up to the end of the year under review 308 samples of ghee were analysed, of which eighty-three samples were obtained from wholesale dealers and 225 from retail vendors. Eighteen of the wholesale dealers' samples and forty of the samples from retailers were found adulterated; fifty-five prosecutions were instituted during the year for selling adulterated ghee, of which seventeen were against wholesale dealers, and thirty-eight against retail traders. Convictions were obtained in twelve cases, the fines inflicted amounting to Rs. 1,214. The number of prosecutions instituted for refusal to sell samples of ghee for analysis was eleven, of these seven were decided during the year, the accused being fined Rs. 830. A big consignment of ghee consisting of 369 maunds was seized at a shop and godown, and was ordered by the Municipal Magistrate to be destroyed. The ghee was sold to the North-west Soap Company and was immediately alkalized in the presence of a food inspector.

Judging from the results of analysis both during the year under report and since, there appears to be a marked improvement in the quality of ghee sold, particularly in wholesale and big retail shops.

The question of the improvement of the milk supply of the city remained in abeyance pending the receipt of Major Matson's report. Meanwhile the possibilities of a site at Gadkhali in the Jessore District for a dairy farm are being investigated, and a suggestion had been made for the formation of a dairy company for the supply of pure milk on a commercial basis.

The total number of vaccinations done during the year was 30,422.

There were 20,667 primary vaccinations, being an increase of about 15 per cent.

The total number of re-vaccinations done during the year was 9,755. The results were successful in 2,469 cases and unsuccessful in 4,173 cases; in 3,113 cases the results were unknown.

The number of vaccinations done at the Vaccination Stations rose from 9,732 to 11,059, the increase being almost wholly due to the large number of vaccinations done in the station at the Sambhunath Pandit Hospital (1,836 against 647). The stations with the highest figures are those situated at the Ezra Hospital (1,421), Campbell Hospital (797) and District Offices I and IV (714 and 711 respectively).

The system of allowing vaccinators to retain the fees for home vaccinations, which was introduced as an experimental measure in July, 1916, was continued throughout the year under report. The results were considered disappointing, but since the close of the year it has been decided to give the system a further trial.

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Mosquito Brigades.

In my last annual report I referred to the recommendations of Dr. Bentley, and the decision of the Corporation to retain the services of the brigades throughout the year instead of having them for a few months only as before.

Besides the above work, nearly 300 cesspits were treated several times, and in 169 cases of obstructions to surface drains were removed.

From the more complete records kept in the district (every tank being examined regularly all the year round), it will be seen that there is a marked seasonal variation in the prevalence of anopheles. Broadly speaking, anopheles are most prevalent in the cold season and least prevalent in the rains. The largest number of breeding grounds were found in December and the smallest in August. A great deal of useful work is carried out by the mosquito brigades, but it must be clearly understood that the present staff is really a nucleus on which I hope a complete organization will gradually be built up.

Lady Health Visitors and Midwives.

The work of the maternity and baby welfare section for the year is of special interest as this is the first complete year the present system has been in operation.

Combining the returns for the two units it will be seen that eight midwives, under the supervision of two lady health visitors, delivered 1,065 women, with only three maternal deaths. One woman died of tuberculosis, another of chronic dysentery, and one from post-partum haemorrhage (placenta-prævia). That is to say, in spite of the appalling conditions under which many of the women were delivered, often after ignorant *dhais* had done their worst, there was only one maternal death due to childbirth in over 1,000 deliveries. The entire absence of serious cases of septicæmia is another gratifying feature and the staff are to be congratulated on the very satisfactory results obtained under extremely unfavourable conditions. A large and well-equipped maternity hospital with a much bigger staff might well be proud of results like these.

Out of 522 deliveries in Circle I there were sixteen twins, the number of babies born being 538.

In Circle II, out of 543 deliveries there were two triplets, fourteen twins, the number of babies born being 561.

The total number of babies born was 1,099 and of these forty were stillborn. Excluding these there were 1,059 living babies born of which sixty-eight died before the tenth day, a mortality rate of 64 per mille. This compares very favourably with the general infantile mortality rate during the first week, viz., 89. Most of the deaths occurred amongst prematurely born babies, particularly the twins and triplets. In Circle II, out of two sets of triplets only one baby survived, and out of fourteen sets of twins only seven babies survived. Only five out of forty deaths amongst infants under 10 days old were full-time babies. The most striking fact, however, is the entire absence of tetanus neonatorum, a convincing proof that this disease is entirely due to dirty midwifery.

As an example of the unnecessary suffering and loss of life caused by the ignorant, dirty, superstitious *dhai*, I quote the following from Miss Lewis' report:—

"In many cases the midwives were called in where the people had tried several unqualified midwives without success. In one particular case *the woman had been five days in labour* before we were sent for. As all my midwives were engaged, I went myself and found the woman in a most terrible condition with a temperature of 105° F. and a correspondingly high pulse rate. On examination bits of fœtus came away and it was impossible to make out the presentation, owing to the decomposed state of the child. The stench was something awful. When I asked the female relatives why they had not sent earlier when they knew that trained midwives were available day and night free of charge, they said that the *dhai* had prevented them and assured them that everything was all right. The male relatives, when questioned, said that they never interfered and when they asked how the woman was progressing, they were informed that she was doing well. I removed the woman to hospital, where she died undelivered a few hours after admission."

Surely it is time that ghastly tragedies of this kind were made impossible by making it a penal offence for any unqualified person to attend a confinement.

Baby Welfare Work.

This branch of work is comparatively new, and is an attempt to adapt the baby clinic to suit local conditions. As all attempts to induce mothers to bring their babies to the lady health visitor for advice and treatment have failed the health visitors visit every baby delivered by the Corporation midwives till it is 3 months old. Where the baby is being artificially fed, what is urgently wanted is an organization for the supply of clean pure milk at reduced rates. Until a municipal dairy is started there is little hope of getting an adequate supply of good milk, but I hope to start small milk depots at the health visitors' quarters on a very moderate scale and if these are a success a small municipal dairy must be started, solely for these depots.

The results of the present system of baby welfare work, imperfect as it is, are very encouraging.

Work done in the Corporation Laboratory.

The total number of samples analysed in the laboratory was 5,496. These samples may be grouped under the following heads:—

I. Chemical examination of water	206
II. Bacteriological examination of water	2,791
III. Chemical and microscopical examinations of blood, sputum, urine, &c., received in the laboratory ...	226
IV. (a) Examination of blood, fæces, urine, &c. ...	69
(b) Examination of rats	37
(c) Examination of vaccine lymph	94
V. Analysis of food-stuffs	2,075
VI. Analysis of substances other than food and water...	64
Total	5,562

Chemical Examination of Water.

Fifty-three samples of filtered water from the collecting wells at Pulta, and twelve samples of water from the river at Pulta, were fully analysed during the year. The amount of dissolved solids was also determined in fifty-three samples of river water at Pulta collected once a week and in the same water after settling. The results of these analyses taken together show that the river water after passing through the filters lost on an average 9 parts of dissolved solids, 0·7 part of total hardness, 0·006 part of albuminoid ammonia, 0·005 part of nitrates, and 0·014 part of oxygen consumed per 100,000 parts. In the process of filtration the filtered water was altogether freed from free and saline ammonia, but the chlorides remained almost unaffected.

The water was found to be free from nitrates and saline ammonia throughout the year. Judged chemically the filtered water of Calcutta is of great purity.

Bacteriological Examination of Samples of Water.

In the filtered water the total bacterial count varied from 8 to 78, the average being 27 colonies per c.c. Lactose fermenters were always absent in 10 c.c. The bacterial efficiency of the filter beds was very high throughout the year. The reduction in the bacterial content of the original water averaged 99·95 per cent.

One hundred and six samples of filtered water were examined for the presence of Comma bacillus with negative results. Thirteen samples of river water collected from the bathing ghats in connection with the prevalence of cholera in the city and two samples of tank water from a bustee where cases of cholera occurred were also examined but no "Comma's" forms were observed.

Chemical and Microscopical Examinations of Blood, &c.

Twenty-five specimens of blood were examined for Widal's reaction with *B. typhosus* and *paratyphosus* and in nine positive results were obtained; eighteen specimens of sputum were examined, of which four showed tubercle bacilli. Two specimens of secretion from the throat taken with swabs gave negative results for diphtheria bacilli; 160 specimens of urine were analysed chemically and microscopically and five specimens bacteriologically for the presence of *B. coli.*

Special Bacteriological Investigations in Connection with Infectious Diseases.

From a report received that three members of a chummery had attacks of enteric, one after the other, within a year, and there being suspicion of the presence of a carrier among the menial staff, all the men employed in the chummery were examined and nineteen specimens of blood were taken. All the specimens were found to give negative Widal except that of the cook, which gave positive reaction with *B. typhosus* in 1 in 20 dilution. The blood of the suspect was examined again and this time positive reaction was obtained even in 1 in 100 dilution. Specimens of urine and stools were collected and examined. The urine was found to be sterile but suspicious colonies were found in Conradi and Drigalski plates and were subcultured in different sugar media for identification. One organism closely resembled organisms of the typhoid-Gärtner group, but no agglutination reaction was obtained with the blood of the suspect. His urine and stools were examined on two further occasions but no organisms of the typhoid group were isolated.

After three months another servant of the same chummery who reported himself to be convalescent from an attack of enteric was sent for examination. Widal's reaction of the blood was found to be negative for typhoid and paratyphoid in 1 in 10 dilution. The specimen of urine was found to be sterile and the examination of the stool showed that organisms of the *B. coli* group preponderated. A few suspicious colonies were found, which on further examination in sugar media were found to resemble organisms of the coli group.

Analysis of Foodstuffs.

The total number of foodstuffs analysed during the year was 2,075.

The following table shows the number of samples of foodstuffs analysed and the results:—

Kind of food	Number of Samples	Number found adulterated	Number found good
Milk	436	203 ...	233
Ghee	716	165 ...	351
Butter	87	7 ...	80
Sweetmeat	275	120 ...	155
Mustard oil	352	116 ...	236
Barley powder ...	30	9 ...	21
Corn flour	11	5 ...	6
Sago	8	6 ...	2
Flour	80	— ...	80*
Cassara food	3	— ...	3
Dal	3	— ...	3
Arrowroot	7	.. 1 ...	6
Rice	21	— ...	21
Chhona	2	.. — ...	2
Honey	3	— ...	3
Sugar	3	.. — ...	3*
Cream	2	— ...	2
Aerated water ...	4	— ...	4
Tea dust	12	— ...	12
Coffee	2	— ...	2
Cocoa	1	— ...	1

* No kaolin found.

Colonial Medical Reports.—No. 106.—Colombo.

ADMINISTRATION REPORT FOR 1917 OF THE PUBLIC HEALTH DEPARTMENT: COLOMBO MUNICIPALITY.

By Wm. MARSHALL PHILIP, M.D., D.P.H.,

Medical Officer of Health.

Population.—The population of Colombo estimated to the middle of 1917 was 258,050, which, reckoned on the area available for building (6,901 acres), represents an average density of 37·4 persons per acre. This seems far from overcrowded, but the vast majority of the people in Colombo are housed in "ground story" buildings, the "upstairs" bungalow, which favours concentration of population, being as yet very much the exception here. This is fortunate in view of the narrowness of the majority of the streets, the smallness of the backyards, and the general absence of back lanes.

The question of housing in Colombo is a serious problem, the accommodation being far short of the requirements. This makes the work of dealing with houses unfit for habitation very difficult, and it has recently been suggested (53, of January 31, 1918) that as the landowners are hanging back in the matter of building houses suitable for the poorer classes, the Council should give a lead by building a sufficient number of model tenements to accommodate all the workmen whom they employ in their service.

Births.—5,860 births were registered in Colombo during the year, representing a birth-rate of 22·7 per 1,000. In these days when national birth-rates are being so anxiously scrutinized in connection with man-power, it may be of interest to state that although the birth-rate of Colombo, *as recorded*, is invariably lower than the death-rate, this does not really mean that the indigenous population is dying out, or in other words, that there is a "natural decrease" here. The census proved, on the contrary, that there is a very good "natural increase" here, and that the indigenous population is rapidly increasing. The explanation of this paradox lies in the fact that many of the births of children born of Colombo parents are not registered *in the town*. As has previously been explained at length, this is due, not to defective registration in Colombo, but to the custom which prevails, especially amongst the Cingalese, whereby prospective mothers go to the homes of their parents, which in many cases are in the country, for the birth of their children—especially their first-born. Such children are presumably registered in the district where they are born, but that does not help the Colombo birth-rate. Such of these children as survive long enough are brought into Colombo by their mothers when they return to their husband's homes, where without increasing the birth-rate they help to swell the infant population, and incidentally to create a fallaciously high infant death-rate, since the infant death-rate is always reckoned on the number of births *registered in the town* during the year.

The true birth-rate of Colombo is therefore undoubtedly higher, while the true infant death-rate is equally certainly lower than the records indicate. It has unfortunately not been found practicable so far to obtain the data necessary for ascertaining the true infant rates here.

Deaths.—6,280 deaths at all ages were recorded in Colombo during 1917, representing a crude death-rate of 24·3 per 1,000, which is the lowest yet recorded. To these must be added 48 deaths of Colombo residents, which occurred in the extra-urban hospital for advanced cases of phthisis at Ragama. On the other hand, 649 deaths of non-residents of the town which occurred in the Colombo hospitals must be deducted, leaving a corrected total of 5,679 deaths of Colombo residents during the year, which represents a death-rate of 22·0 per 1,000. A further correction for age and sex constitution gives a death-rate of 25·9 per 1,000, which is the nearest approach to the correct death-rate of Colombo that can at present be obtained.

Race Death-rates.—The rates of exotic races like Europeans and Tamils are liable to considerable vitiation as the result of migration of these people to and from their homelands. Thus during the last three years large numbers of young European males have left Ceylon in order to take part in the war; while on the other hand, numbers of old people and children, who would in normal times have gone home, have remained in the island. Scarcity of employment has doubtless led to a good many Tamils returning to their own country.

Infant Mortality.—The infant death-rate during the year was 251 per 1,000. Great as this wastage of infant life is, it is nevertheless a great improvement upon what used formerly to occur here. It has fallen from a rate of 410 in 1903 to 251 in 1917, i.e., from being 34 per cent. above, to 24 per cent. below the mean for the fifteen years 1903-1917.

The diseases which were chiefly responsible for the deaths of infants during the year were atrophy and debility, premature births, convulsions, diarrhœa and pneumonia. The chief causes of infant mortality in Colombo are (*a*) those which affect the mother, and through her the child before birth, e.g., bad housing and insanitary conditions generally in and around the home, such as prevail to a great extent in the slums; (*b*) those conditions which affect the child after birth, including those referred to in (*a*) and in addition improper feeding, con-

tamination of food by flies and otherwise, and the debilitating effect of epidemic diseases, especially measles.

Thus one finds that the highest *average* infant ward mortalities occur in the wards with the highest average densities, which in turn denote the existence of slums, and it is not to be expected that the infant death-rate of Colombo will fall to what may be considered a satisfactory level until these slums have been abolished. Another very important sanitary measure in connection with the infant mortality here is the abolition of the insanitary, fly-breeding and disease-spreading dry-earth latrines, and the substitution of water-carriage, in which respect the progress made hitherto has been painfully slow, although sewers are now nearly everywhere available in the more densely populated parts of the town.

Pulmonary Diseases.—Under this heading are included phthisis, pneumonia and bronchitis. The death-rate from these causes is of special interest not only because phthisis and pneumonia are the two greatest causes of mortality in Colombo, but also for the reason that whereas it rose steadily during a period of at least thirteen years, from 5·41 per 1,000 in 1897 (prior to which the statistics are unreliable) to the extraordinarily high rate of 9·32 in 1909, it has since fallen rapidly during the last eight years to 5·73 in 1917 per 1,000, i.e., nearly half what it had been.

There are thus two distinct periods to be considered, one a period of degeneration extending from 1897 to 1909, and the other a period of improvement extending from 1909 to 1917.

1897-1909. Period of Degeneration.—The gradual increase of mortality from pulmonary diseases during the period 1897-1909 was undoubtedly due to a gradual degeneration in the housing conditions in extensive areas of the town, concurrently with or more correctly as a sequence to the increase of the population at a time when there was no proper legal control in respect of such important sanitary matters as the lighting and ventilation of dwellings, the erection of new buildings, the provision of drainage, &c.

Thus, the increase of the population necessarily created a steadily growing need for more house accommodation which, in the absence of a sufficient number of houses to meet the demand, led to overcrowding and a rise in rents. This in turn encouraged landlords to increase the rent-earning capacity of their properties, which, in the absence of effective legal control, and in defiance of the efforts of the Council's officers to direct it on sanitary lines, they proceeded to do by (*a*) subdividing their houses so that each house might accommodate more than one family. This was effected by nailing up communication doors or by erecting partitions, both of which tended greatly to obstruct the lighting and ventilation of the buildings; (*b*) by making obstructive additions to their houses, which further interfered with lighting and ventilation; (*c*) by erecting new buildings upon such open spaces as remained upon their properties, which still further interfered with the lighting and ventilation not only of their own, but also in many cases of their neighbour's houses as well, and in addition rendered access for scavenging more and more difficult and the problem of drainage more and more complicated.

Thus whole properties, and as time went on whole blocks and eventually whole areas of the town became covered with a medley of irregularly disposed, badly designed, defectively constructed, ill-lighted and insufficiently ventilated dwellings, stretching in many cases far back from the public street. In this manner what are now known as the "insanitary areas" or "slums" of Colombo, were gradually created, and it is just in such areas that the mortality from pulmonary diseases, but especially from phthisis, is always highest. As an illustration of this point two adjoining areas were selected for comparison in 1911 in connection with the prevalence of phthisis. The population of each of these areas having been obtained from the census, the number of cases of phthisis which had occurred in each during the year was as far as possible ascertained, whereupon it was found that whereas the non-congested area had had 1·33 cases per 1,000 of its population, the congested area had had 4·70 cases or more than three times as many in proportion to its population.

1909-1917. Period of Improvement.—In view of the explanation which has just been given of the gradual rise in the death-rate from pulmonary diseases, as a sequence to the progressive increase of the population, the question naturally arises as to why, since the population has continued steadily to increase, did the death-rate not also continue to rise? Why on the contrary has it been steadily falling since the last quarter of 1909?

The answer to these questions is to be found in a study of the sanitary records of Colombo, from which it may be concluded that the improvement has taken place as follows:—

Although the insanitary conditions in the town had been carefully investigated and although moreover the crude data required for the calculation of the death-rates were available in the Registrar-General's Reports on vital statistics, no attempt appears to have been made prior to 1906 to work out and tabulate in comparative form the death-rates from individual diseases in Colombo.

The result of this was that although various large schemes for the general sanitary improvement of the town were recommended, and some of them were adopted and taken in hand, there was a want of specific knowledge in regard to the relative importance of, and a consequent lack of concentrated effort directed towards the prevention of individual diseases such as phthisis, although the cost of such special measures was in some cases insignificant compared with the benefits to be derived therefrom. As an illustration of this point it will be found that whereas epidemic diseases, such as cholera, smallpox and enteric fever, are frequently referred to in the older reports, phthisis is seldom or never even mentioned, although, as will presently be shown, it was then as it is now the chief cause of deaths in Colombo.

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In Report No. 383, dated June 11, 1906, attention was for the first time directed to the fact that the diseases of the pulmonary group but especially phthisis, were the greatest causes of deaths in Colombo.

Following upon this disclosure special measures for the prevention of phthisis were undertaken by the Public Health Department at the earliest opportunity. Thus in view of the well-known fact that deficiency of light and air in dwellings is a powerfully predisposing factor in the causation of phthisis, an effort was made to improve matters in these respects in the small tenement class of dwellings in the insanitary areas. This work has been continued up to date, and has had a very considerable effect in improving the lighting and ventilation of small dwellings, and may therefore fairly be regarded as having been in a measure responsible for the reduction in pulmonary mortality which was first observed during the last quarter of 1909.

In view of the fact that phthisis is what is known as a " house disease "—the infection once implanted in a house tending to linger there and attack subsequent occupants, the direct preventive measure of disinfecting every house where a death from phthisis occurred was undertaken as soon as the necessary staff was available, in July, 1909, and continued up to the present time. This work must have had a powerful effect in preventing the spread, and in reducing the mortality from phthisis from July, 1909, onwards.

The Government appointed a Commission in January, 1910, to inquire into and report upon tuberculous diseases generally in Ceylon, and upon the most effective measures for checking their dissemination. Their seven recommendations included the introduction of compulsory notification, the establishment of a hospital for advanced cases, the segregation of the sick from the healthy, the establishment of sanatoria, the education of the people in matters relating to the prevention of phthisis, the prevention of spitting in public places, and the abolition of coir mats as spittoons, the prevention of dust, &c.

In addition the Commission made the important recommendation that an Anti-tuberculosis Dispensary should be established in Colombo, on the lines of the original one which was founded by Sir R. W. Philip in Edinburgh.

As a result of all this investigation and representation the following measures were subsequently adopted, and have without doubt had their share at various stages in reducing the mortality from pulmonary diseases.

Phthisis was made a compulsory notifiable disease in August, 1910.

Spitting in public conveyances and public places was made a punishable offence by by-law in November, 1910.

The evacuaton and closure pending improvement of houses unfit for habitation was rendered possible by the advent of plague which automatically brought the Plague Regulations in respect of such buildings into force in January, 1914.

The Anti-tuberculosis Institute was opened in October, 1916.

The hospital at Ragama for advanced cases of phthisis was opened in February, 1917.

To sum up therefore the improvement in the mortality from pulmonary diseases which has been going on during the period 1909 to 1917 has been due chiefly to the following:—

From 1907.—Improvement in the lighting and ventilation of insanitary tenements.

Improvement in the general cleansing and scavenging of the town—especially (since 1909) in the matter of dust prevention. The effect of both of these measures would necessarily be cumulative and take some time to produce any effect upon the death-rate.

From July, 1909.—Disinfection of phthisis " death-houses." The effect of this measure would be immediate.

From August, 1910.—Compulsory notification of phthisis, followed by visitation, instruction of occupants and adoption of precautions in connection with persons suffering from the disease.

From October, 1916.—Establishment of the Anti-tuberculosis Institute.

From February, 1917.—Establishment of the hospital at Ragama for advanced cases of phthisis.

The establishment of the Anti-tuberculosis Institute being of recent date has scarcely had time yet to produce much effect upon the death-rate, but it opens a vast field of useful work and is expected to have a powerful effect in reducing the prevalence of and the mortality from phthisis in Colombo. A complete understanding with a view to co-operation between the Institute and the Public Health Department has been arrived at.

No other single disease caused so many deaths in Colombo during the year as phthisis, which has held the premier place as a cause of deaths for a number of years and therefore merits the title of " The captain of the men of death " which was conferred upon it over 200 years ago in England by John Bunyan.

Diarrhœal Diseases.—Under this heading are included diarrhœa and enteritis with 511 deaths, and dysentery with 134 deaths. The more specific term " enteritis " is gradually supplanting the term " diarrhœa " in the death returns.

The diseases in this group are all what are sometimes described aptly as " filth diseases," and their mortality therefore affords a valuable indication of the state of the town as regards general cleanliness and scavenging.

The remarkable association between the " diarrhœa " mortality and the state of the town as regards general cleanliness is shown by the following brief histories of the scavenging and cleansing on the one hand, and the " diarrhœa " mortality on the other hand.

History of Scavenging and Cleansing.—Prior to

1903 no systematic inspection with a view to the cleansing and scavenging of private premises was carried on. During 1903 and 1904 a system of routine house-to-house inspection was gradually evolved and introduced with the result that there was an undoubtedly great improvement in the state of the town as regards cleanliness of compounds, &c. This work of private scavenging was however much hampered by the very unsatisfactory manner in which the public scavenging was conducted. At that time the public scavenging was carried on by a system of contract which as the result of two years of strenuous endeavour to make it a success was ultimately demonstrated to the satisfaction of the Council to be a wholly impracticable system of carrying out such work. The Council therefore decided to abandon the contract system in favour of departmental work. It necessarily took some time to organize this work, but by 1907 it had been placed upon a fairly satisfactory footing and has since then been steadily improved until now it must be patent to everyone that the scavenging of Colombo is an exceptionally well-conducted public service.

History of Mortality from Diarrhœal Diseases.—The death-rate from diarrhœal diseases which had been gradually rising since 1899, suddenly dropped in 1904 coincidently with the improvement in scavenging of private premises referred to above. It began to fall again in 1907 as the result mainly of the improvement in public scavenging at the hands of the Works Engineer, and it has continued to fall ever since, until in 1917 the record low death-rate of 2·50 was attained.

All Fevers.—Under this heading are included enteric fever, continued fever, remittent fever, and intermittent fever.

The death-rate from this group of diseases gradually fell from 3·75 in 1897 to 2·01 in 1905. It then rose to 3·28 during the abnormally unhealthy year of 1906, and as a result, a great deal of enteric infection was implanted in the town in the shape of "carriers" and otherwise. Since 1906 it has with two exceptions steadily fallen, the exceptions being the years 1911 and 1916, during each of which there was a slight set-back in respect of enteric fever. Every race has shared in the improvement, and none so strikingly as the Europeans, whose rate is however liable to fallacious variations owing to the smallness of the community and their habit of migrating to England. Thus since the war began, although there are no complete statistics available, it is well known that a large number of the young and susceptible males have left Ceylon, and this no doubt accounts to some extent for the very marked drop in the mortality from enteric fever which has occurred during the last three years.

With a view to the prevention of enteric fever in Colombo, it is essential that not only should the work of connecting latrines to the sewers be pressed on as fast as possible, but also that every other measure which will tend to reduce the prevalence of flies should be adopted. Thus the open storing of manure for garden purposes, and the top-dressing of grass fields with manure and scavenging rubbish in proximity to residential quarters must be rigorously put down, otherwise there is no hope of controlling the fly nuisance with its associated dangers of enteric, dysentery, diarrhœa of infants, &c.

Plague.—The chief points of interest in regard to plague during 1917 were as follows:—

There was an unusually large number of cases during the first three and a half months of the year, and the outlook at one time threatened to be serious. Thus whereas the average number of cases during the first fifteen weeks of the three previous years was only 5·6 cases per week, the average during the corresponding period in 1917 was 10·3 per week, or nearly double.

It was observed that as hitherto, the cases were occurring almost exclusively amongst the occupants of insanitary ranges of tenements, and as the ordinary measures of isolation, segregation, fumigation of rat runs, &c., failed to check the spread of the disease, it was decided to resort to the more drastic measures of evacuation and closure of the worst of these insanitary tenements. Thus, whereas only thirty-three insanitary dwellings had been closed during the first quarter, 129, mostly in the infected localities, were closed during the second quarter.

The effect of this measure was that the number of cases of plague suddenly dropped during the sixteenth week, from being far above the average for the corresponding period of the previous three years, to below the average and remained much below during the rest of the year.

This experience confirms the conclusion which had previously been arrived at that *evacuation and closure of insanitary dwellings is by far the quickest and most effective of the measures for the prevention and suppression of plague in insanitary areas.*

The effect of evacuation appears to go further than merely the removal of the occupants from immediate danger. It appears very often to have the effect also of stamping out the disease amongst the rats in the locality. The healthy vigorous hungry rats no doubt move into the adjoining occupied areas in search of food, while the plague rats, on the other hand, especially those in the acute and most infectious stages, have no desire for food, are languid, weak, and in the later and most infectious stages are even paretic, and in consequence probably remain for the most part in and die in their tunnels or are killed there later by the fumigation. The rat fleas which live and breed in the rat nests being thus deprived of both human and rat hosts perish in a very short time and thus the place becomes plague free. No doubt a certain number of rats in the early stages of the disease, or suffering from chronic plague, or "carriers," still retain sufficient vitality and interest in food to range away from the evacuated dwellings into the adjoining areas, but the system of establishing a circle of Clayton fumigators around the infected house and working towards it as a centre tends to prevent migrations of this sort.

Rat Plague.—Out of a total of 23,382 rats examined for plague, seventy or 0·30 per cent. were found to be infected. The highest rates of infection occurred in February and March, and the lowest in May to September. Six domestic cats, all of which were found looking ill in premises known to be plague infected, were examined with the result that three were found to be plague infected.

The seventy-three cases of animal plague recorded during the year came from thirty-nine streets, in twenty-four of which cases of human plague also occurred. Rat plague occurred in fifteen streets where no human cases occurred.

One thousand two hundred and fifty-six rats were killed by the Clayton fumigators during the year, and sixteen mummified rats, which had probably died of plague, were found either within or close to the infected houses. Although infected rats were found in twenty-four streets in which human cases occurred, they were found in only nine of the actual houses in which human cases occurred.

Preventive Measures.—The preventive measures adopted were as usual, removal of the patient to hospital, segregation of contacts, pesterining floors, unroofing of infected houses to let the sun in, fumigation of rat holes, and, where dangerous outbreaks were threatening, evacuation and closure of insanitary tenements pending the carrying out of the necessary improvements by the owners of the properties.

Thus during 1917, 1,699 dwellings were pesterined, 35,262 rat holes in 8,285 buildings were fumigated by means of the Clayton machines and filled up with cement, &c., and 196 dwellings where plague had actually occurred were unroofed.

The work of rat capture and poisoning is carried out by the Department of the Veterinary Surgeon to whom I am indebted for the information that 160,261 rats were trapped and 228 were found dead, making a total of 160,489 for the year.

Sanitary Inspection.

Non-structural Improvements. — The defects come chiefly under the heading of "Filthy premises" and include such gross defects as dirty dwellings, collections of garbage and household rubbish generally, in the compounds, dirty latrines, catchpits, drains, &c., unclean bakeries, eating houses, boutiques, dairies, aerated water factories, laundries, &c., nuisances associated with the keeping of animals, nuisances asociated with offensive trades and such like.

As a result of personal instruction and warning, and where this failed, then as the result of written notice or prosecution 4,066 of the defects were rectified during the year.

Insanitary Dwellings. — Structural Improvements.—The defects fall into two classes (*a*) defects in the premises exclusive of the buildings, e.g., broken drains, lack of drains, lack of paving in compounds, &c.; (*b*) defects in buildings, e.g., obstructive buildings, obstructive partitions, obstructive eaves, insufficient door or window space, lack of smoke vents, enclosed verandahs, &c. As the result chiefly of written notices 495 buildings, and 514 buildings other than dwellings, were structurally improved during the year. 184 dwellings (i.e., separately assessed tenements) which were so defective and insanitary as to be unfit for human habitation were closed, while 111 which were hopelessly obstructive or otherwise defective, were demolished during the year. It is a well known fact that badly designed and irregularly disposed buildings, such as the closure notices invariably deal with, not only obstruct lighting and ventilation, but are at the same time far more prodigal of space than are properly designed and methodically arranged buildings. Thus the condemnation of a medley of insanitary tenements frequently results in the erection in their place of ranges of healtby new dwellings the total accommodation of which is much in excess of what has been abolished. Many of the existing dwellings are so grossly insanitary than nothing can justify their being allowed to remain and occupied by human beings, since they constitute a perpetual danger to tbe health and life not only of those who reside in them but also to the healtb and safety of the public at large, as the experience bere in connection with such diseases as plague and phthisis has demonstrated again and again.

Dairies and Milk Supply.—The ordinary cowmen and milk vendors have no sanitary conscience, and constant supervision is therefore necessary in the conduct of dairy operations, otherwise all sorts of abominations are liable to be perpetrated. As the supervision which can be exercised by tbe Sanitary Officers is necessarily very occasional, it is fortunate that a few of the better classes have within the last year or two taken up the business of owning and personally conducting dairies. It is also fortunate that this work has attracted the interest of tbe Colombo Ladies League, which had done much to encourage emulation hy offering a number of prizes and certificates each year for the best kept dairies.

Tbe sanitary condition of dairies is vastly better now than it used to be but it still leaves much to he desired.

Bakeries.—The condition of the bakeries during the year was on the whole satisfactory, but much difficulty is experienced in securing compliance with the rule tbat the workmen shall wear clean aprons and caps, and shall keep their hands and nails clean. To engage in the mixing and kneading of dough with dirty hands and nails is an unpardonable offence.

Eating Houses.—They are for the most part very simple and indeed primitive in their arrangements, as one cannot set the standard too high in regard to the quality of the accommodation, furnishing, &c., without entailing an undue limitation in the number of these essential establishments. The manner in which they are conducted and their general sanitary condition has however been greatly improved, and there are now a number of really well-furnished and very well-conducted eating houses or restaurants in the City.

Laundries.—Laundry houses like eating houses, are constantly springing up and disappearing all over the town. This is due to the fact that laundry work, as conducted here, requires practically no stock-in-trade, and can be started practically anywhere, at a moment's notice, all that the laundryman requires being water, soap, a washing stone, a heating iron, a table, and an utter disregard for the rapid destruction of one's most cherished linen. The sanitary requirements, although also quite simple, are less easy to attain, viz., clean water, separate accommodation for clean linen, soiled linen, and domestic purposes, paved floors and cement faced walls in the linen rooms so that bugs and other vermin may not find these places too convenient and secure a refuge from which to sally forth and torment and possibly convey disease to the dhoby's customers.

The question of improving laundry work in Colombo is full of difficulties. It is recognized that to allow washing of clothes in such places as the Lake, in the stagnant water of swamps and such like, is grossly insanitary, but, for public health and other reasons tbe time has come when the old order must be abolished and new methods must be adopted.

Offensive Trades.—None of the offensive trades such as plumbago curing, copra storing, manure storing, &c., may be established in Colombo without a licence from the Chairman. The interests of the public health demand that the residents of the town shall be protected against nuisance, while, in the interests of legitimate trade and as a matter of equity, where licences have already been granted, the tradesmen should be granted reasonable facilities for the establishment of, and should be secured against undue disturbance in the carrying on of these trades.

As the present discretionary method of granting licences is most unsatisfactory, and if continued, will, it is feared, result in much trouble, and possibly great expenditure in the future, it is urged that the matter be considered at the earliest opportunity and that a definite policy be adopted for the guidance of the executive officers of the Council on the one hand and of the tradesmen concerned on the other hand.

Markets.—There are two types of markets in Colombo, viz., public markets, built and owned by the Municipal Council, the stalls in which are let or leased; and private markets, represented for the most part by roadside shops or boutiques.

While the public markets leave much to be desired, and require for the most part complete rearrangement and reconstruction on up-to-date lines, the private markets, but especially the roadside boutiques in which meat and fish are sold, are infinitely worse. They are in fact without exception, primitive, grossly insanitary and a constantly recurring source of public nuisance. A definite policy in regard to the market service of the town being urgently required for the establishment of a series of public markets to serve the needs of the population.

Slaughter-house.—No slaughter of animals for food, is allowed except in the Municipal Slaughter-house at Welikade, unless a special licence is obtained for private slaughter.

A considerable number of applications for private slaughter in connection with religious ceremonies are received annually and they are generally allowed.

The cruel method of slaughter by cutting the animal's throat without previous stunning, is adhered to by the Mohammedan butchers on religious grounds and has for that reason been allowed to continue. An attempt was made some years ago and was at the request of the Society for Prevention of Cruelty to Animals renewed during 1917, to induce the Cingalese butchers to stun the animals before bleeding, by using the Humane Cattle Killer (a species of gun), but without success, the butchers refusing to use it on the mercenary grounds that it damaged the brains of the animals and made them unmarketable. If stunning is to be introduced here it must be made compulsory by law, but there are almost insuperable difficulties in the way of introducing this, even in the case of animals the flesh of which is destined for the use of non-Mohammedans.

The public slaughter-house is merely a paved shed, open all round, in which animals are slaughtered within sight of each other. This has been objected to on humanitarian grounds, and the adoption of a system of "separate slaughter" has been advocated by some people. There are, however, arguments both for and against each system, and in the writer's opinion the balance is, on sanitary grounds, distinctly in favour of the Hall system.

The slaughter-house is accessible to crows which infest the place and foul the meat. Crow-proofing by means of wire-netting should be carried out as has previously been recommended.

Food Inspection is carried on with difficulty in Colombo owing to the lack of a special staff for that purpose. It is comparatively easy to detect unsound food in the public markets where whole ranges of stalls can be inspected in a few minutes, but it is very different when one has to deal with scores of small boutiques scattered all over the 100 miles of streets in the town.

A considerable amount of difficulty is experienced in inspecting damaged rice imported through the Customs, as this task has to be carried out by the Pettah Ward Inspector in addition to his multifarious other sanitary duties.

House Drainage. Public Latrines and Bathing Places.—The slowness, for unavoidable reasons, of the progress which has been and is being made in the matter of connecting house latrines to the sewers, and the abolition of the insanitary, fly-breeding, disease-spreading dry-earth privies may be judged from the fact disclosed in the City Sanitation Engineer's reports, that up to the end of 1917 only 3,496 water closets had been installed in the town, thus enabling only 2,912 dry-earth privies to be removed.

Colonial Medical Reports.—No. 106.—Colombo (*contd.*).

A more satisfactory feature is the establishment up to the end of the year, of a total of twenty-eight public latrines throughout the town, with seating or rather squatting accommodation for 430 persons. In conjunction with a number of these latrines, bathing accommodation is provided with places for a total for the town of 198 persons. The principle has now been adopted of building a greater number of small public latrines in different parts of the town, as it was considered that this would meet the public needs and convenience better than having a smaller number of large latrines.

Mosquito and Fly Prevention.—As everyone knows, the average householder will do practically nothing in sanitary matters unless he is required to do so by law. The very fact that there is no specific law on any particular subject induces those who have not had the necessary scientific teaching to enlighten them, to believe that any attempt on the part of officials to enforce preventive measures is merely an unwarrantable and vexatious interference with their liberties, which they are liable to resent accordingly.

Notwithstanding the lack of specific powers for dealing with insect pest nuisances, a good deal of useful work was done during the year, including practical demonstration to householders of mosquito breeding in their premises.

It is unfortunate for the safety and comfort of the inhabitants of Colombo that the very practical recommendations which were submitted four years ago by Major James, I.M.S., after a year's work in connection with mosquitoes in Colombo, have not yet been given effect to, even in the simple matter of making it a punishable offence for householders or owners of property to permit the breeding of mosquitoes on their premises.

Colonial Medical Reports.—No. 107.—Hongkong.

HONGKONG MEDICAL AND SANITARY REPORTS FOR THE YEAR 1917.

The Sanitary Department.

Diseases.—There were 595 cases of small-pox as compared with 220 in 1916. The vaccination campaign was ably carried out by Dr. Woodman, who received the greatest assistance from Mr. Tsó and other Chinese gentry. By the end of February the epidemic had practically ceased. The total up to March 5 being 549 cases. The other diseases notified during the year were: enteric fever, 188; diphtheria, 69; puerperal fever, 20; paratyphoid fever, 7; and scarlet fever, 3.

Population.—The last census was taken in 1911. The estimate of the population for 1917 is based on the usual rate of increase of the numbers given in the last census with the addition of 10,000 allowed for the influx of Chinese due to the revolution. This estimate is probably much too low, but only by taking another census could reliable information be obtained.

Owing to the war the estimate of the white population for 1916 has been adopted unchanged for the year 1917.

House Cleansing.—House building has gone on and the staff has been depleted thus rendering it impossible to maintain a quarterly cleansing. Barely three house cleansings per annum have been possible.

Limewashing.—The annual limewashing of Chinese tenement houses is still carried on and entails a great amount of trouble both to this Department and to the general public. Little or no improvement has resulted from By-law 4, which makes compulsory limewashing possible, and it would seem as if the only possible solution of the difficulty lay in making this measure a part of the ordinary routine public scavenging services.

Scavenging and Refuse Disposal.—In May the barges conveying town refuse were unable to remove all the material by making one trip on each alternate day and had to make the journey daily. A new steam barge, S.D. 2, was therefore built and taken over by the Department.

There was a brisk demand for manure from the Cattle Depots in Kennedy Town, but owing to the existence of cattle disease (anthrax) in the latter half of the year it was deemed inadvisable to permit the use of this manure in gardens. It was accordingly dumped at sea.

Adam Gibson, M.R.C.V.S.

Joint Report of the Principal Civil Medical Officer and the Medical Officer of Health.

Area.—The Sanitary Board's control extends over the island of Hongkong, which has an area of about 32 square miles, and to that portion of the mainland between the shore and the range of Kowloon Hills extending from the village of Tseung Kwan O in Junk Bay on the east, to the village of Kau Pa Kang on the west, with a seaboard of about 13 miles and an area of about 16 square miles.

This area includes "Old Kowloon," which has

RETURN OF DISEASES AND DEATHS IN 1917 IN THE CIVIL, VICTORIA, GAOL AND TUNG WA HOSPITALS.

Hongkong.

GENERAL DISEASES.

	Admissions	Deaths	Total Cases Treated
Alcoholism	54	2	54
Anæmia	55	4	55
Anthrax	—	—	—
Beriberi	868	297	910
Bilharziosis	—	—	—
Blackwater Fever	1	—	1
Chicken-pox	3	—	3
Cholera	—	—	—
Choleraic Diarrhœa	—	—	—
Congenital Malformation	—	—	—
Debility	145	49	161
Delirium Tremens	—	—	—
Dengue	6	—	6
Diabetes Mellitus	—	—	—
Diabetes Insipidus	—	—	—
Diphtheria	28	13	29
Dysentery	219	55	230
Enteric Fever	51	4	56
Erysipelas	3	—	3
Febricula	37	—	38
Filariasis	—	—	—
Gonorrhœa	92	—	96
Gout	1	—	1
Hydrophobia	1	1	1
Influenza	69	—	72
Kala-Azar	—	—	—
Leprosy	8	1	8
(*a*) Nodular	—	—	—
(*b*) Anæsthetic	2	1	2
(*c*) Mixed	—	—	—
Malarial Fever—	—	—	—
(*a*) Intermittent	—	—	—
Quotidian	2	—	2
Tertian	15	—	15
Quartan	—	—	—
Irregular	—	—	—
Type undiagnosed	—	—	—
(*b*) Remittent	—	—	—
(*c*) Pernicious	599	99	605
(*d*) Malarial Cachexia	62	8	66
Malta Fever	—	—	—
Measles	5	—	5
Mumps	23	—	23
New Growths—			
Non-malignant	41	—	41
Malignant	29	9	30
Old Age	1	—	1
Other Diseases	267	97	272
Pellagra	—	—	—
Plague	19	19	19
Pyæmia	2	2	2
Rachitis	—	—	—
Rheumatic Fever	—	—	—
Rheumatism	92	—	93
Rheumatoid Arthritis	—	—	—
Scarlet Fever	3	—	3
Scurvy	1	—	1
Septicæmia	29	6	29
Sleeping Sickness	—	—	—
Sloughing Phagedæna	—	—	—
Small-pox	11	11	11
Syphilis	—	—	—
(*a*) Primary	137	20	138
(*b*) Secondary	42	—	43
(*c*) Tertiary	68	1	69
(*d*) Congenital	3	—	3
Tetanus	30	28	30
Trypanosoma Fever	—	—	—
Tubercle—	183	34	188
(*a*) Phthisis Pulmonalis	378	219	402
(*b*) Tuberculosis of Glands	—	—	—
(*c*) Lupus	—	—	—

GENERAL DISEASES—*continued.*	Admissions	Deaths	Total Cases Treated
(*d*) Tabes Mesenterica	—	—	—
(*e*) Tuberculous Disease of Bones	—	—	—
Other Tubercular Diseases	—	—	—
Varicella	—	—	—
Whooping-cough	2	—	2
Yaws	—	—	—
Yellow Fever	—	—	—

LOCAL DISEASES.

Diseases of the—			
Cellular Tissue	599	60	652
Circulatory System	34	9	37
(*a*) Valvular Disease of Heart	5	—	5
(*b*) Other Diseases	—	—	—
Digestive System—	698	74	730
(*a*) Diarrhœa	—	—	—
(*b*) Hill Diarrhœa	—	—	—
(*c*) Hepatitis	—	—	—
Congestion of Liver	—	—	—
(*d*) Abscess of Liver	—	—	—
(*e*) Tropical Liver	—	—	—
(*f*) Jaundice, Catarrhal	—	—	—
(*g*) Cirrhosis of Liver	—	—	—
(*h*) Acute Yellow Atrophy	—	—	—
(*i*) Sprue	—	—	—
(*j*) Other Diseases	—	—	—
Ear	13	—	13
Eye	258	—	275
Generative System—	—	—	—
Male Organs	96	—	100
Female Organs	68	1	69
Lymphatic System	92	1	95
Mental Diseases	9	—	11
Nervous System	345	87	369
Nose	2	—	2
Organs of Locomotion	53	—	55
Respiratory System	534	139	559
Skin—	49	—	45
(*a*) Scabies	—	—	—
(*b*) Ringworm	—	—	—
(*c*) Tinea Imbricata	—	—	—
(*d*) Favus	—	—	—
(*e*) Eczema	—	—	—
(*f*) Other Diseases	—	—	—
Urinary System	382	158	405
Injuries, General, Local—	1014	55	1052
(*a*) Siriasis (Heatstroke)	—	—	—
(*b*) Sunstroke (Heat Prostration)	—	—	—
(*c*) Other Injuries	40	4	40
Parasites—	54	—	54
Ascaris lumbricoides	—	—	—
Oxyuris vermicularis	—	—	—
Dochmius duodenalis, or Ankylostoma duodenale	—	—	—
Filaria medinensis (Guinea-worm)	—	—	—
Tape-worm	—	—	—
Poisons—	136	39	151
Snake-bites	—	—	—
Corrosive Acids	—	—	—
Metallic Poisons	—	—	—
Vegetable Alkaloids	—	—	—
Nature Unknown	—	—	—
Other Poisons	—	—	—
Surgical Operations—	—	—	—
Amputations, Major	—	—	—
,, Minor	—	—	—
Other Operations	—	—	—
Eye	—	—	—
(*a*) Cataract	—	—	—
(*b*) Iridectomy	—	—	—
(*c*) Other Eye Operations	—	—	—

been British since 1861, and has an area of about 2¾ square miles, and a portion of the New Territories, leased to this Government in 1898.

The remainder of the New Territories—about 266 square miles—is outside the Board's jurisdiction.

The City of Victoria, situated on the northern side of the Island, has a frontage on the sea of nearly five miles and is separated from the Kowloon portion of the Colony by the harbour.

The domestic buildings in Victoria number 10,335 (excluding barracks and police stations), of which 992 are non-Chinese; there are also 183 European dwellings in the Hill District. The number of houses completed during the year was as follows: Victoria 163, Kowloon 120, outlying districts and Peak 52, making a total of 335, as compared with 314 in 1916.

Month	Barometer at M.S.L.	Temperature. Max.	Mean.	Min.	Humidity. Rel.	Abs.	Cloudiness.	Sunshine.	Rain.	Wind. Direction	Vel. Miles per hour
	Ins.	Deg.	Deg.	Deg.	Per cent.	Ins.	Per cent.	Hours	Ins.	Points	
January	30·24	60·7	55·8	51·7	63	0·29	56	169·9	0·345	ENE	11·0
February	30·13	64·4	59·4	55·3	72	0·37	64	134·5	0·405	E by N	12·9
March	30·09	65·9	61·6	58·4	78	0·43	78	116·9	2·670	E by N	14·2
April	29·89	73·5	69·4	66·4	86	0·63	87	76·9	5·230	E	13·5
May	29·87	79·4	74·8	70·9	82	0·72	73	168·6	9·685	E by S	9·9
June	29·78	86·6	81·8	78·4	83	0·90	80	167·8	11·540	S by W	8·4
July	29·69	85·4	81·1	77·7	83	0·88	73	189·5	30·075	SE by S	8·8
August	29·76	87·2	82·0	78·3	83	0·90	55	239·6	11·950	SSW	7·4
September	29·86	86·6	82·0	78·1	77	0.85	50	266·5	4·880	E	10·4
October	29·95	81·3	77·0	73·8	73	0·68	38	258·8	2·470	E by N	14·0
November	30·12	72·7	68·2	64·7	60	0·43	56	189·2	0·095	ENE	12·5
December	30·15	63·7	59·2	55·2	60	0·32	43	209·0	1·140	ENE	11·6
Mean or Total	29·96	75·6	71·0	67·4	75	0·62	63	2187·2	81·485	E by S	11·2

In addition to the above, miscellaneous buildings, such as offices, godowns, &c., were erected to the number of 63.

Administration.—The City of Victoria is divided into twelve, and Old Kowloon into three Health Districts, with an inspector in charge of each. The inspector in charge of No. 3 Health District has also charge of the sanitary work on the Peak.

There are also five inspectors engaged in the supervision of scavenging and conservancy work including the upkeep of dust-carts, boats, &c., used in this connection.

In the outlying districts the sanitary work is supervised by the police officer of the district. The inspectors in Hongkong work under the supervision of the Medical Officer of Health, and in Kowloon under that of the Assistant Medical Officer of Health.

General Sanitary Conditions.—The activity in building operations which has been such a noticeable feature since 1912 has not abated and the demand for housing accommodation for the Chinese is still in excess of the supply.

The Colony has several times since 1911 been subjected to the influx of many thousands of Chinese seeking refuge from disturbances in their own country and of these not a few appear to remain after the majority have returned to China.

In connection with anti-plague measures to keep rats as much as possible out of houses 111 ground surfaces have been cemented in Victoria and 27 in Kowloon, whilst 496 buildings have had rat-runs filled with cement in Victoria and 487 in Kowloon.

Obstructions have been removed from backyards in twenty-six houses.

Notices prohibiting the breeding of mosquitoes were served to the number of 38 in Victoria and 15 in Kowloon.

Other sanitary improvements have been carried out by the Public Parks Department during the year, including additional nullah training, and scavenging lanes have been provided.

Meteorological Returns.—The following table gives the meteorological data recorded by the Royal Observatory during the year:—

The rainfall for the year was slightly more than in 1916 and is rather above the average of the last decade.

Population.—The distribution of population estimated to the middle of 1917 was as follows:—

Non-Chinese Civil Population		13,500
Chinese Civil Population:—		
City of Victoria (including Peak)	280,700	
Villages of Hongkong	15,300	
Kowloon (including New Kowloon)	77,200	
New Territories (land)	89,900	
Population afloat	58,500	
Total Chinese Population		521,600
Total Civil Population		535,100

The population figures have been estimated by the usual method based on the natural increase, as shown by the census returns of 1906 and 1911, to which the number 10,000 has been added to allow of the influx of Chinese due to disturbances in the Kwongtung Province.

There is no means of estimating the number of Chinese in the Colony at any given time except by a census, and until a new census is taken the present estimated population figures must be considered to be quite unreliable and are in all probability much too low.

The civil population consists chiefly of male adults, but owing to the disturbances in China

during the last few years, which resulted in the immigration of refugees and their families, the proportion of females to males appears to be increasing.

The boat population numbered 58,500, and the registered boats belonging to the port and villages of Hongkong are as follow:—

Passenger boats, classes A and B	1,114
Lighters, cargo and water boats	1,759
Other boats...	13,068
Fish drying hulks	60
Total	16,001

There is a large passenger traffic between Hongkong and the mainland of China; the number travelling by the river steamers being as follows: Arrivals, 870,837; Departures, 844,480; whilst the figures for the Kowloon-Canton Railway are: Arrivals, 352,008; Departures, 309,394.

Births.—The births registered during the year were as follows:—

	Male	*Female*	*Total*
Chinese	1,458	661	2,119
Non-Chinese	142	139	281

This gives a general birth-rate of 5·3 per 1,000, as compared with 6·1 in 1916 and 6·1 in 1915.

The birth-rate among the non-Chinese community was 20·08 per 1,000. The nationality of the non-Chinese parents was as follows: British 128, Filipinos 8, Portuguese 66, Indian 47, American 5, Malay 7, Parsee and Eurasian 3 each, French, Arab, West Indian and Jewish 2 each, Dutch, Turkish, Swiss, Italian, Australian, Japanese and Russian 1 each.

The number of births of Chinese nationality registered does not give an accurate record of the number of births which has occurred. Owing to the custom of the Chinese of not registering any birth unless the child has survived for a month, and often, in the case of female children, not at all, it is probable that the majority, if not all, of the infants who are sickly at birth or die before reaching the age of one month have not been registered. It is customary, therefore, to assume that all children of one month or less admitted to the various convents, together with those found dead in the streets, harbour, hillsides, &c., have been born in the Colony but have not been registered. The addition of this number to that of the registered births gives a more correct estimate of the birth-rate. The number of such children in 1917 was 886.

The birth-rate so corrected is therefore 7·3, and for the Chinese community the rate becomes 6·9 instead of 4·9 per 1,000, but even this addition is not sufficient as the total of infant deaths is still greater than the total of births so calculated, from which it is evident that many are brought into the Colony from the mainland of China.

The preponderance of male over female registered births is very marked among the Chinese, there being 219 males to every 100 females.

In the non-Chinese community the proportion of male to female births was 102 to 100.

Deaths.—The total number of deaths registered during the year was 10,433. The general death-rate was 23·4 per 1,000.

The number of deaths amongst the Chinese was 10,244, which gives a death-rate of 23·7 per 1,000.

The deaths registered in the non-Chinese civil community numbered 189, giving a death-rate of 14·00 per 1,000. The nationalities of the deceased were as follows: British 53, Portuguese 38, Annamite 3, Indian 24, Japanese 29, Malay 7, French 5, American and Filipinos 8 each, Russian, Italian and Eurasian 2 each, Dutch, Peruvian, Jewish, Swiss, Canadian, Brazilian, Australian and Parsee 1 each.

The death-rate for Europeans and those of European origin is 7·7 per 1,000; 5·9 per 1,000 for Indians; and 16·9 per 1,000 for races classed as mixed or coloured.

The exclusion of the Army and Navy from these statistics increases both the birth- and death-rates for Europeans and Indians.

Age Distribution of Deaths.—The total number of deaths of infants under 1 year of age was 3,596, being 34·4 per cent. of the total number of deaths. The number of deaths of children between 1 and 5 years of age was 1,640.

There were 32 infant deaths among the non-Chinese, being 11·1 per cent. of the total number of deaths.

Among the Chinese population the deaths of infants numbered 3,564, while only 2,119 Chinese births were registered, or taking the corrected number of births among the Chinese to be 3,005, as explained above, it is still found that there were more deaths than births. It is obvious, therefore, that many infants must be brought in from China, or the births in Hongkong concealed.

Diseases.

Respiratory Diseases.—The total number of deaths of this nature was 2,248, of which 34 were among the non-Chinese community. Of these 1,130 occurred in infants under 1 year of age. Pneumonia was the cause of 360 deaths, 16 of which were non-Chinese and 55 of which occurred in infants under 1 year. Broncho-pneumonia was the cause of 1,172 deaths, 8 of which were non-Chinese and 805 of which occurred in infants under 1 year. The death-rate among the Chinese from diseases of this system was 5·1 per 1,000.

Tuberculosis.—The number of deaths from tubercular disease was 1,493 and 23 of these occurred in non-Chinese. There were 877 deaths from pulmonary tuberculosis, 859 Chinese and 18 non-Chinese, and 57 deaths from tubercular meningitis. The percentage of deaths due to tuberculosis was 14·3.

Nervous Diseases.—The number of deaths from these during the year was 427, as compared with 405 last year. The deaths of Chinese infants from tetanus and convulsions were 159, and from meningitis undefined 75.

Malaria.—The number of deaths from malaria in 1917 was 416, of which all but 5 occurred in Chinese. In a large proportion of the cases the disease was contracted outside the area of the Sanitary Board.

Colonial Medical Reports.—No. 107.—Hongkong (*contd.*).

Beriberi.—There were 654 deaths from this disease during the year. With the exception of two deaths in Indians and one in Japanese all occurred in Chinese.

Ankylostomiasis.—During the year specimens of the fæces of 500 prisoners at the gaol were examined by Dr. McKenny and 94 of these were found to be infected.

Infectious Diseases.—The number of these notified during the year was 919, of which 38 were plague and 595 small-pox.

Plague.—The incidence of this disease was very light, there being only 38 cases; 36 of the patients were of Chinese nationality, 2 non-Chinese. Thirty-five deaths occurred. Two cases were imported.

During the year a total of 106,522 rats were caught, an average of 291 per diem. Thirty-one were found to be infected with plague.

Owing to the increase of plague-infected rats found during May, June and July, rat poison was laid down in many Chinese houses throughout the city with satisfactory results.

Enteric Fever.—The number of cases of this disease notified during the year was 188. Five cases were imported. The cases of European or American nationality were 21, Portuguese 2, Japanese 4, Indian 6, and Parsee 1. The remainder of the cases were Chinese.

It has not been possible to trace the source of the infection in these cases, nor the direct infection of one case from another. The incidence of the disease has not been of the nature of a water or milk-borne epidemic, but may have been acquired by the eating of raw vegetables grown by the Chinese method or by the eating of shell-fish. As it is the custom in Hongkong to use uncovered latrine buckets in Chinese latrines the contamination of food by flies probably plays a considerable part in conveying this disease.

Paratyphoid Fever.—Seven European cases were notified.

Scarlet Fever.—Two European cases and one Portuguese were notified.

Small-pox.—During the year 595 cases occurred. In the latter six months of the year only four cases were notified.

Diphtheria.—Sixty-nine cases occurred during the year two of which were imported; 62 of the cases affected were Chinese.

Puerperal Fever.—Twenty cases were notified, one of which was of Japanese nationality, one Portuguese, and the remainder occurred in Chinese.

Public Bath Houses.

The following table shows the number of persons who have used the four public bath houses in the city during the year:—

District.	1917.
Wanchai (men only)	156,968
Pound Lane (men and women)	251,393
Second Street (men only)	56,920
Sheung Fung Lane (women and children)	30,049
	495,330

Ambulance Service.

Ambulances can be procured at any time of the day and night from the disinfecting stations.

Ambulances are also obtainable in Victoria from the Eastern and Western District Sanitary Offices. Coolies for ambulance work are available.

J. T. C. Johnson, F.R.C.S.Ed.

Abstract of Report by Dr. H. Macfarlane, *Acting Colonial Veterinary Surgeon.*

Disease in Depots.

Rinderpest.—Twenty-three cases occurred in the Kennedy Town Depot chiefly in the earlier part of the year.

Anthrax.—Seven cases of anthrax were found during the year. All of the cases occurred in October and November. Five came from Wuchow. Importation of cattle from Wuchow was prohibited for the remainder of the year.

Tuberculosis.—As in former years no case occurred in cattle, but three cases were found in dairy cows sent in for slaughter.

Black Quarter.—Two cases of black quarter occurred.

Kennedy Town Crematorium.

The carcases destroyed in the crematorium for the year were:—

Cattle	222
Sheep and Goats...	42
Swine	218
Horses	75
Dogs and miscellaneous animals	216
Condemned meat from Slaughter House ...	13,692 *lb.*

Rabies.—Dogs were unmuzzled throughout the year. Six dogs were detained at Kennedy Town under observation but none were found to be infected.

Importation of dogs from Shanghai and Chinese ports north of Shanghai was prohibited until further notice.

Importation of dogs from Canton was prohibited for six months from July 20.

Civil Hospital.

Abstract of Report by Dr. C. W. McKenny, *Superintendent.*

The total number of admissions was 3,292. This includes 99 patients brought over from 1916.

One hundred and seventeen patients were in hospital at the end of the year. The daily average of patients was 108·3.

Out-patients.—8,829 came for treatment; 7,421 new prescriptions and 5,644 old prescriptions were dispensed; 3,178 vaccinations were performed.

Nationality of Patients.—Europeans 378, Indians 685, Asiatics 2,229.

Sex of Patients.—Male 2,666, Female 626.

Deaths.—167 deaths occurred, which gives a death-rate of 5·07 per cent. Of these deaths 71 (i.e., 42 per cent.) occurred within twenty-four hours of admission.

Various death-rates:—					*Per cent.*
Men	110 deaths	=	4·1
Women	57 ,,	=	9·1
Europeans...	12 ,,	=	3·1
Indians	15 ,,	=	2·1
Asiatics	140 ,,	=	6·2

Injuries accounted for 51 deaths and diseases of the respiratory system for 23.

Review of the medical work performed:—

PREVALENT DISEASES.

		Death-rate percentage.
Malaria	361	1
Typhoid fever	46	6
Beriberi	81	6
Dysentery	37	0
Tubercle	95	8
Diphtheria	17	29
Rheumatism	46	0
Respiratory System	183	12
Digestive System	314	5

Among rare diseases may be enumerated: Blackwater fever, 1; hydrophobia, 1; Raynaud's disease, 1; disease of ductless glands, 4; sprue, 4.

Operations.—444 operations were performed.

Maternity Hospital.—There were 383 patients admitted. There were 156 male and 134 female infants born. Four cases of twins occurred and 23 infants were stillborn.

Deaths.—Four mothers died: three from nephritis (present on admission) and one from shock following an operation. Ten premature children died.

INFECTIOUS DISEASES HOSPITAL, KENNEDY TOWN.

REPORT BY DR. C. W. MCKENNY, *Medical Officer.*

The hospital was open during the year as follows: From January 1 to April 12; from December 24 to December 31.

Thirteen patients were carried over from 1916. Twenty-three new patients were admitted during the year. Of the total (36), 31 patients were suffering from small-pox, 2 from chicken-pox, 2 were in attendance, and 1 was under observation but proved not to be small-pox.

The patients were classified as follows: European, 22; Japanese, 5; Eurasian, 5; Indian, 3; Chinese, 1.

Four deaths occurred, which gives a death-rate of 12·9 per cent. among the 31 cases of small-pox treated. Three of these patients were suffering from the confluent and one from the hæmorrhagic type of the disease.

The following table shows the relationship between vaccination and the virulence of small-pox.

	RASH.			RESULT.	
	Confluent.	Discrete.	Hæmorrhagic.	Cured.	Died.
Unvaccinated	7	4	1	8	4
Vaccinated in childhood	1	9	...	10	..
Multiple vaccinations ..	1	8	...	9	...

VICTORIA GAOL.

REPORT BY DR. C. W. MCKENNY, *Medical Officer.*

Health of the prisoners has been satisfactory. Six deaths from disease took place. The causes were as follows: Tuberculosis, 3; cancer, 1; beriberi, 1; typhoid fever, 1.

Seven prisoners were liberated for medical reasons. They suffered from: phthisis, 5; insanity, 1; syphilis, 1.

Four cases of typhoid fever were admitted with one death.

Two cases of dysentery were admitted with no death.

Twenty-six cases of beriberi were admitted with one death.

None of these patients contracted the disease in gaol, and they showed for the most part improvement during their term of imprisonment.

Eighteen cases of pulmonary phthisis were recorded with two deaths.

Twenty-eight cases of malaria occurred with no deaths.

As in 1916, during July and August an epidemic of dengue occurred. The condition was similar in mildness and lack of complications to that of last year and numerically less important.

Fifty-eight persons required medicinal treatment as a result of indulgence in opium.

Conditions of Prisoners on Admission to Gaol.

The following facts show the physical condition of prisoners on their admission. They are of interest as compared with the figures of actual disease and as an indication of the bodily state of the criminal class.

It was found that 1,105 were physically unfit, i.e., 33·6 per cent. of the total admissions to gaol. Of these 1,105 it was found that:—

(*a*) 367 were under weight, i.e., their weight was much below the standard weight for each individual height. These men were graded into two classes. The first class (297) was able to perform light work and the second (70) was unfit for labour which required any serious effort.

(*b*) 208 were incapacitated owing to age, i.e., they were above 50 years of age. All of these were unfit for any form of laborious toil.

(*c*) 493 were suffering from disease or the results of disease. It was necessary to admit 59 of these to hospital at the time of or within a few days of their entry into gaol.

(*d*) 37 were on reduced labour by reason of juvenility.

There were 147 females admitted.

The total admissions were 3,286.

The total admissions to hospital for illness were 174. The dengue epidemic cases are not counted in this total.

The total number of prisoners who received treatment in the out-patient department was 998.

Vaccinations.—2,244 prisoners were vaccinated and of this number 945 were successful, 718 unsuccessful, and 581 were not examined owing to early discharge at the expiration of their sentence.

During the year 500 prisoners were examined with a view to ascertaining whether they were infected with certain common intestinal parasites on admission to gaol.

It was found that over 60 per cent. were harbouring the round-worm (*Ascaris lumbricoides*), almost 50 per cent. the whip-worm (*Trichocephalus dispar*), and 22 per cent. the hook-worm (*Ankylostomum duodenale*).

Kowloon and the New Territories.

Report by Dr. J. T. Smalley, *Medical Officer.*

Kowloon-Canton Railway.

The health of the European and Asiatic staff has been good throughout the year. There has been very little malaria amongst the staff at the stations in the New Territories.

There were five serious accidents on the railway resulting in the death of four persons and severe injuries to thirteen others. The medicine chests in the trains and at the stations have been kept replenished. They have proved to be of great service during the year.

Kowloon and New Territories.

During the first quarter there was a severe outbreak of small-pox, being the extension of the outbreak that started in December, 1916, the last few cases occurring in April. A vigorous vaccination campaign was instituted, about 90,000 vaccinations being performed in Kowloon by a willing band of helpers and myself; in addition a large number of vaccinations were performed by the Chinese Public Dispensaries and the Kwong Wa Hospital.

The campaign was extended to the New Territories where after a few demonstrations by me the whole work was carried on by the District Officer, A.S.P., and the Police Force, with the help of the Government vaccinators.

Great credit is due to them all for the splendid work they did. In Kowloon vaccination centres were installed in Hung Hom and Yaumati Police Stations and at my house. At the latter 5,522 people were vaccinated before January 1, and 3,249 after that date.

The bulk of the work was done by standing in the streets and vaccinating the passers-by and by house-to-house visitation. I think great credit is due to the band of helpers—included in them are the European staff and interpreter at Hung Hom and Yaumati Police Stations, sanitary inspectors, &c.—who worked very hard with me in addition to performing their normal duties.

With the exception of this outbreak the year has been a healthy one. Only five cases of plague were recorded at the Public Mortuary.

At the Public Mortuary 1,503 post-mortems were performed, as compared with 980 in 1906. The increase is partly due to 154 cases of small-pox and partly to the rapid expansion of the district.

During the year 18,751 rats were examined. Eleven were found to be plague-infected.

The British schools and missionary establishments have been visited regularly and all scholars and inmates examined and reported on. These reports are forwarded—when necessary—to the parents for compliance with my remarks, which mainly concern the condition of the teeth, throat and eyes. This procedure has resulted in a marked improvement in the condition of the children's teeth and, as a natural sequence, their general health. New inmates of the missionary establishments were vaccinated in December.

Kowloon Dispensary.

It is again satisfactory to note that the Chinese aversion to Western medicine is becoming very steadily less marked. Whereas last year about one-third of the patients attending were Chinese, their numbers this year constitute well over a half of our total.

Tung Wa Hospital.

Report by Dr. C. W. McKenny, *Visiting Medical Officer.*

University Students (*Medical Clinic*).—During the year, as heretofore, students have attended for lectures, case-taking and anæsthetic work in this hospital.

The following figures express the comparative results of Eastern and Western treatment. It should be understood that all cases admitted are diagnosed by a staff trained in European methods and the diagnosis is then confirmed or rejected by the visiting medical officer. It is then quite open to the patient to choose whichever of the two forms of treatment he may desire. The methods of Eastern medicine are not interfered with provided they do not endanger public health and sanitation. To the credit of the Eastern practitioner it must be stated that he frequently refuses to treat conditions in which he believes Western methods to be more successful.

The total number of in-patients were divided thus:—

Cases treated by native methods:—	
Original choice	3,062
Transferred from Western treatment ...	213
	3,275
Less transferred to Western treatment ...	872
Total	2,403
Cases treated by Western methods:—	
Original choice	2,290
Transferred from native treatment ...	872
	3,162
Less transferred to native treatment ...	213
Total	2,949

As the total number of cases treated was 5,352, it will be seen that of this number 55·1 per cent. were under European and 44·9 per cent. under Eastern treatment. Last year the figures were respectively 50·7 per cent. and 49·3 per cent. This is the largest percentage of European treatment that has yet been attained and is a definite improvement on the figures for 1915 (52·3 per cent.

European treatment) which had constituted a record.

Death-rates.

Deaths under native treatment	1,064	44·2 per cent.
Deaths under Western treatment	391	13·2 ,,

These rates can hardly be looked upon as accurately representing the mortality in the hospital as they include 598 moribund cases which were distributed as follows:—

Native treatment	496
Western treatment	102

If these be deducted we may consider the following as accurate:—

Native treatment 1,907 cases with 568 deaths = 29·7 per cent. mortality.

Western treatment 2,847 cases with 289 deaths = 10·1 per cent. mortality.

Remarks on Special Diseases

Beriberi.—In all 826 cases were treated, with 291 deaths.

It is to be noted that more careful examination of the patients in the wards of the medical clinic frequently revealed the fact that in addition to the disease for which the patient had been admitted he was also suffering from beriberi.

Such additions would probably bring the total up to 1,000.

It may, therefore, be said that some 20 per cent. of all patients in hospital were suffering from beriberi.

The number of cases of this disease is increasing and must be considered as easily the most important cause of physical disability among the poorer class of natives.

It has a lower mortality than phthisis but probably causes more general harm than that malady.

Malaria.—There were 303 cases treated, with 102 deaths, i.e., 33·6 per cent.

The following were the various types as differentiated by microscopic examination:—

Malignant	257	cases	with	94	deaths.
Benign tertian ...	10	,,	,,	0	,,
Quartan	2	,,	,,	0	,,
Malarial cachexia ...	34	,,	,,	8	,,

The usual routine as to treatment was observed.

Plague.—Nineteen cases with nineteen deaths were recorded.

Diseases of Central Nervous System.—293 such cases were admitted, but it is of interest to note the extremely rare occurrence of locomotor ataxia and general paralysis of the insane. It is generally admitted that these diseases are the result of syphilis, but here we have the curious fact that syphilis is a common disease among our patients and does attack the central nervous system, but not as either of the above diseases, except in a fractional percentage of cases.

Colonial Medical Reports.—No. 108.—Agra and Oudh.

REPORT OF THE UNITED PROVINCES FOR THE YEAR 1917.

By C. MACTAGGART, C.I.E., M.A., M.B., Colonel, I.M.S.,

Inspector-General of Civil Hospitals and Officiating Sanitary Commissioner, United Provinces.

General Population—Vital Statistics.

General.

According to the census of 1911 the total population of these Provinces (excluding certain revenue estates formerly belonging to the Meerut District but transferred to the Delhi Province) amounts to 46,820,556. On this figure (as in 1916) are calculated all the birth- and death-rates shown in this report.

(Note.—The terms "towns" and "urban areas" refer only to towns with a population of 10,000 and upwards and the term "rural tracts" to districts excluding such towns.)

The birth-rate of the Provinces in 1917 was 46·08 per mille of the population, against 43·09 in 1916, and 44·91 the quinquennial average. The provincial death-rate was 37·91, as compared with 29·50 in 1916 and 31·55 the mean for the previous five years. It will be seen that the birth-rate is higher than that of the preceding year by 2·99 and than the quinquennial average by 1·17. It is satisfactory to note that this rate (46·08) has been exceeded only four times during the last thirty-seven years, viz., in 1899 (48·09), 1913 (47·67), 1904 (46·67), and 1903 (46·13). The death-rate in 1917 exceeded that of the preceding year by 8·41. The excess has been chiefly due to mortality from fever and plague, the death-rates of which are higher by 5·75 and 1·71, respectively, than those of the preceding year.

Colonial Medical Reports.—No. 108.—Agra and Oudh (*contd.*).

The birth- and death-rates and the infantile mortality of these Provinces are, in the subjoined table, compared with those of other provinces. The position of the United Provinces was third as regards high birth-rates, ninth as regards low death-rates, and seventh as regards low infantile mortality.

Province	Birth-rate	Death-rate	Infant mortality
United Provinces ...	46·08	37·91	215·73
Bombay	35·72	40·76	216·67
Madras	32·37	26·23	193·99
Bengal	35·91	26·19	184·60
Bihar and Orissa ...	40·45	35·21	180·43
Assam	31·35	27·09	189·28
Central Provinces ...	48·13	36·06	226·15
Punjab	45·34	37·91	247·95
Burma	36·25	25·30	213·14
North-West Frontier Province	32·11	29·95	194·27
Delhi...	52·75	32·68	224·16

Births.

During the year under report 2,157,642 births were registered, against 2,017,756 in the preceding year (an increase of 139,886), the birth-rates being 46·08 and 43·09, respectively. The quinquennial average is 44·91. The birth-rate curve was below the monthly provincial average (3·84) during the months of February, April, May, June, and July and higher in the remaining months of the year—the actual rates in the former months being 3·46, 3·79, 3·38, 2·85, and 3·48 respectively, and in the latter months, viz., January (4·06), March 3·97), August (4·14), September (4·40), October (4·32), November (4·06), and December (4·15).

The proportion of male to female births during the year 1917 was 108·36 : 100. The ratio of male to female births has been practically constant for the last seven years.

The excess of births over deaths amounted to 8·17 per mille of population, against 13·59 in 1916. The excess was shared by all the districts of these Provinces with the exception of Shahjahanpur, Pilibhit, Naini Tal, Budaun, Kheri, Bareilly, and Ghazipur. In Shahjahanpur the excess of deaths over births was due mostly to fever and " all other causes " and partly to cholera. In Pilibhit and Kheri it is accounted for by high mortality from fever. In Naini Tal, where the birth-rate is also very low, it was due to fever and partly to cholera, dysentery and diarrhœa and respiratory diseases. The excess of deaths over births in Budaun was due to fever and, to a certain extent, to small-pox; in Bareilly to fever and partly to cholera. Plague and cholera were responsible for the excess in Ghazipur.

Deaths.

The total number of deaths recorded during the year under report was 1,774,896 and the death-rate per mille of the population was 37·91, against 1,381,299 and 29·50, respectively, for the preceding year and the quinquennial average of 31·55.

Twenty-three districts out of forty-eight recorded death-rates above, and twenty-five death-rates below, the provincial average.

In 1917 the number of deaths among males was 933,723 and among females 841,173, against 720,097 and 661,202, respectively, in 1916, the corresponding death-rates being 38·17 and 37·62, against 29·43 and 29·57. The total mortality was higher among males than females, but, taking the death-rates at different age periods, more females died than males between the ages of 5 and 30.

In 1917 the infantile mortality, though higher than that of the preceding two years, was considerably lower than that of other previous years except 1912. The total number of deaths during the year under report was 465,467, against 423,130 in 1916, showing an increase of 42,337 over the figure of the preceding year. Fever accounted for the largest number of deaths (228,139), followed by tetanus (113,574), against 205,583 and 116,833, respectively, in 1916. The number of deaths from tetanus is still suspiciously high, although its percentage to the total infantile mortality has declined to 24·4 in 1917 from 27·6 in 1916 and 31 2 in 1915.

The following measures were adopted for the reduction of infantile mortality:—

Pamphlets containing instructions to mothers and midwives, in Urdu and Hindi, have been distributed in many districts.

In twelve districts 104 *dais* were admitted to training in midwifery and the care of young children. Of this number 20 passed the examination, 62 were discharged, and 22 remained at the close of the year.

The three co-operative dairies at Benares, Lucknow, and Allahabad were maintained during the year 1917. The business of the Lucknow co-operative dairy continues to shrink owing to the heavy indebtedness of its members and the consequent impossibility of advancing money for the purchase of new cattle.

Important as the question of the supply of properly trained *dais* is in order to reduce infantile mortality, I believe that a far more important question is the provision of a cheaper supply of reasonably pure milk. Indian mothers almost invariably nurse their children, but in thousands of cases, when the mothers' milk-supply is for various reasons insufficient, children die of malnutrition because the parents are unable to buy milk for them at the prevailing rates, and I do not hesitate to say that if the cost of milk could be reduced in our municipalities, to a figure which would bring the milk within the reach of the poorer classes, more would be effected towards reducing infantile mortality than the presence of any number of trained *dais* would accomplish. The whole question of the supply of milk in our cities was recently considered by the Sanitary Board, and the recommendations of the Board were forwarded to Government; but the question is a most difficult one to solve.

The number of " stillbirths " which took place in 1917 was 31,954, against 26,541 in 1916.

Medical officers and their subordinates and inde-

pendent medical practitioners submitted, as usual, the returns of deaths which occurred in the course of their practice, and of which the causes were definitely ascertained.

Of the 4,412 deaths verified during the year, 67 were attributed to intermittent and remittent fevers, 21 to enteric fever, 2 to simple fevers, 315 to other fevers, 502 to pneumonia and other respiratory diseases (excluding 303 from phthisis), 496 to dysentery and diarrhœa, 360 to injuries, 100 to hepatic congestion and abscess, 81 to anæmia and debility, 14 to splenic diseases, and 35 to apoplexy and heat-stroke. Small-pox caused 20, measles 32, cholera 203, and plague 429 deaths. The number of deaths reported from "all other causes" was 1,432.

Chief Diseases.

Cholera.

The total number of deaths from cholera registered in all the districts amounted to 21,440 in 1917, against 33,300 in 1916, the death-rates from this disease being 0·46 and 0·71 respectively, as compared with 1·00—the average for the preceding five years. A peculiar feature of the disease last year was its persistence in epidemic form into the late cold weather in certain districts.

Fourteen districts out of forty-eight recorded a death-rate higher, and thirty-one lower, than the provincial average, 0·46. It is interesting to note disinfection of wells by permanganate of potash or bleaching powder was carried out; it proved more or less satisfactory.

The mortality from cholera in the urban areas was 0·84 and that in the rural tracts 0·43, against 0·75 and 0·71 respectively in the preceding year.

Small-pox.

During the year under report 2,011 deaths occurred from small-pox, giving a death-rate of 0·04 per mille of population as compared with 1,515 and 0·03 respectively in 1916. The highest mortality occurred in May and the lowest in October.

Plague.

In 1917 the death-rate from plague was 2·76 per mille of population, against 1·05 in the preceding year. The quinquennial average was 1·85.

The total number of deaths recorded in 1917 was 129,084, against 49,368 recorded in 1916. It is rather disquieting that, after a steady decline in the plague mortality during the preceding five years, the disease should have reappeared with such greatly increased incidence during the year under report, but the climatic conditions of the year were favourable for the spread of plague. The hot weather conditions set in late and were less marked and less prolonged than usual, and the rains opened early, the result being that the winter epidemic was prolonged, the disease did not die out altogether as usual in the hot months and many foci of disease remained. As a supplement to the medical establishment of the districts, eighty-seven travelling dispensaries were employed during the year as in the preceding three years. As anti-plague measures inoculation and evacuation were resorted to as usual.

Fevers.

During the year under report 1,266,519 deaths from fever were registered, against 997,496 in 1916, representing a death-rate of 27·05 and 21·30, respectively. The quinquennial average was 21·74.

The largest number of deaths from fever this year occurred in May, as has been the case for several years past except in 1915 and 1916.

From the weather conditions of the year 1917, it appears that rainfall was in excess of the normal in certain months of the year, and this probably caused more malaria than usual, but deaths from malaria undoubtedly constitute only a small proportion of the deaths returned as due to "fever."

School Quininization.—Owing to the great rise in the price of quinine and the necessity for conserving the stock of the drug in India, the quininization of school children was ordered by Government to be altogether dropped in 1917, and until the price of quinine fell to a reasonable figure. A proposal made by Lieutenant-Colonel Harriss, to issue "residual alkaloid" as a substitute for quinine was not accepted by Government.

During the year under report 2,056 one-rupee packets, 1,023 three-rupee packets, and 560 five-rupee packets of quinine were sold, against 6,267 one-rupee packets in the preceding year.

Quinine amounting to 300 lb. was also issued from the Aligarh Jail for the use of the travelling dispensaries.

The disease is certainly very prevalent in the Rohilkhand and Agra Divisions, and probably is more or less epidemic all over the western and northern districts.

An outbreak of scarlet fever with 133 cases and 38 deaths occurred in the Pithoragarh Sub-Division, Almora District. By proper and timely segregation of the sick and early treatment through the agency of the travelling dispensary the outbreak was controlled.

Dysentery and Diarrhœa.

The total number of deaths registered from these diseases during 1917 amounted to 22,308, against 17,731, and 19,477 in the two preceding years, the respective rates being 0·48, 0·38, and 0·41. The quinquennial average was 0·37.

The highest mortality from these causes was returned in May (2,522) and the lowest in February (908).

Respiratory Diseases.

Diseases of the respiratory organs accounted for 28,926 deaths in 1917, as compared with 25,963 in 1916, the death-rates being 0·62 and 0·55 respectively. The quinquennial average is 0·49. As stated in previous Annual Sanitary Reports, deaths from respiratory diseases are not sufficiently recog-

nized by the local reporting agencies. Averaging from the return of medical practitioners there should be, exclusive of phthisis, 201,949 deaths and a death-rate of 4·31 instead of 28,926 reported with a death-rate of 0·62.

The highest mortality from these causes was recorded in April and the lowest in July.

Injuries.

During the year under report 26,753 deaths were recorded from injuries, giving a death-rate of 0·57 per mille of population, against 27,149 and 0·58 respectively in 1916.

In 1917 the number of deaths reported to have been due to suicide was 2,404—610 among males and 1,794 among females—against 2,219 in 1916.

The total number of deaths caused by wounds and accidents in 1917 was 17,283, and 6,807 deaths were caused by snakes and wild beasts, while the loss of life from rabies during 1917 was 259.

Sanitation Department.

Observations.

The provincial birth-rate, which had been falling for the last three years, rose again to 46·08 per thousand of the population, which, though 1·59 lower than the rate for 1913 (the record since 1899), is 1·17 higher than the quinquennial average, and has been exceeded only four times in the last thirty-seven years. Only two provinces, Delhi and the Central Provinces, showed a higher rate. The birth-rate in municipalities was 47·93, the highest recorded in the last thirty-seven years. In notified areas the rate was 46·60.

The provincial death-rate was 37·91 per thousand. This was 8·41 higher than the rate for the previous year and 6·36 higher than the average for five years, though only 0·42 higher than the average for the preceding ten years (1907 to 1916). Only one province, Bombay, showed a higher rate, while that for the Punjab was the same. The death-rate in municipalities was 47·10, an increase of 10·56 over the previous year, and in notified areas 41·71, an increase of ten. This excess is chiefly due to the mortality from fever and plague.

The infantile mortality, though higher than that of the preceding two years, was considerably lower than that of other previous years except 1912. The high proportion of deaths from tetanus still throws doubt on the accuracy of the diagnosis of the causes of infantile mortality, though the steps taken for the verification of reports in Benares, Allahabad and Cawnpore appear to have resulted in a reduction of the proportion in these municipalities. Whatever allowance be made for inaccuracies, there can unfortunately be no doubt that the number of deaths from tetanus, a disease usually due to uncleanly midwifery, is extremely high. Good work is being done in the training of midwives in Dufferin hospitals with the aid of the Victoria Memorial Fund scholarships, but the systematic attempt to train bazar *dais*, which has been carried on for a number of years, has proved a failure. It has been found impossible to get these women to observe the most rudimentary rules of cleanliness, and they are too much attached to their old hereditary methods ever to abandon them. A scheme for the grant of diplomas to trained midwives is now under the consideration of the State Board of Medical Examinations. There is much weight in what the Sanitary Commissioner says in regard to infantile mortality that, important as the question of supply of properly trained midwives is, a far more important question is the provision of a cheaper supply of reasonably pure milk.

There was a satisfactory increase in the number of birth and death entries tested by the local authorities and by the vaccination staff. Of the districts showing the largest number of entries tested by local authorities, Gorakhpur is easily first, followed by Allahabad, Hamirpur, Hardoi and Basti. That there is still room for improvement is shown by the great divergence in the number of entries tested in different districts, the extremes being 214 in Bulandshahr and 103,431 in Gorakhpur. As regards the work of the vaccination staff, Garhwal and Bulandshahr headed the list for the third year in succession.

The greatest increases in mortality from particular diseases, as compared with the previous year, were shown under fever and plague. The only disease the death-rate from which fell was cholera, under which 21,440 deaths were registered, giving a death-rate of 0·46 per thousand. The death-rate from this disease has been lower only eight times in the last forty-seven years. Bleaching powder was substituted for permanganate of potash for the disinfection of wells under the cholera scheme, but the supply of bleaching powder was only possible to twelve out of the twenty districts protected by the scheme. It is remarkable that the ratio of the death-rates in the protected and unprotected districts, which in the six years before the introduction of the scheme was as three to one, and in the three years 1914 to 1916 was nearly equal, returned in 1917 to a proportion of three to one. It is very probable, as the Sanitary Commissioner suggests, that this rise in the ratio is due to the insufficient supply of permanganate and bleaching powder. There can be no doubt that the systematic cleaning of wells has been doing good and saving life.

There was a great increase in the number of deaths from plague, of which 129,084 were recorded as against 49,368 in 1916. The death-rate of 2·76 was 0·91 higher than that of the quinquennium, and only 0·02 lower than that of the preceding ten years. It is disquieting, as the Sanitary Commissioner remarks, that after a steady decline in the plague mortality in the preceding five years, the disease should have reappeared with such greatly increased incidence; but the climatic conditions of the year, with its late and short hot weather and its early rains, were specially favourable for the spread of plague.

The greatest increase was in the number of deaths registered as due to fever, which was 1,266,519 as against 997,496 in the previous year. The death-rate, 27·05, is higher by 5·31 than the quinquennial average, and by 0·62 than the average for the preceding ten years. Very little progress could be made with malarial investigation owing to the scarcity of qualified officers, and when Colonel Harriss reverted to military duty in July, 1917, the work had to be closed till the end of the war. The quininization of schools had to be discontinued owing to the prohibitive price of the drug. The ahnormally early and heavy rains probably caused more malaria than usual, but deaths from malaria undoubtedly constitute only a small proportion of the deaths returned as due to fever. The districts in which there was the highest mortality are chiefly those in which relapsing fever is present in epidemic form, and the Sanitary Commissioner is convinced that one of the main factors, if not the main factor, in the high mortality in these districts was relapsing fever. Travelling dispensaries which could be spared from plague work were lent to these districts, which are mainly those of the Agra and Rohilkhand divisions, and a pamphlet giving in simple language the symptoms, treatment and means of preventing this disease was prepared by Dr. Pandya and widely circulated.

The expenditure on works of a sanitary nature under the provision of the Sanitary Engineer amounted to Rs. 16,18,320, exclusive of the cost of preparation of schemes. Among the more important sanitary works completed may he noted the anti-malarial works at Meerut, Saharanpur and Nagina. The water works machinery at Lucknow and Allahabad continued to give trouble. It is hoped that the improvements effected will prevent further breakdowns, hut it is clear that in both cases the trouhle was largely due to neglect of ordinary petty repair and maintenance.

The post of Sanitary Commissioner was held hy Lieut.-Colonel Harriss up to July 25, 1917, when, on his reversion to military duty, Colonel Mactaggart took charge of the duties in addition to his own duties as Inspector-General of Civil Hospitals. The thanks of Government are due to both these officers and to Mr. West, who has held the office of Sanitary Engineer throughout the year.

Colonial Medical Reports.—No. 109.—New South Wales.

REPORT FOR THE YEAR 1916.

By ROBERT T. PATON,

Director-General of Public Health.

Year by year the need for the amendment and consolidation of the Public Health Act of New South Wales becomes more and more evident. In common with all the other States of Australia, the Public Health Act of this State is framed more or less closely upon the model of the English Public Health Act of 1875, with modifications in several directions to meet the special needs of this country. Many provisions for the control and safeguarding of the public health are, however, to he found in other legislative enactments than the Public Health Act, as for instance the Local Government Act, Dairies Supervision Act, Noxious Trades Act, Cattle Slaughtering Act, &c. The dissemination of legal provisions for the safeguarding of the public health in so many different Acts constitutes a weakness in administration. Comparing the public health of the different States of Australia it will be found that that of New South Wales is the most conservative and cumbrous to administer. This latter fact is due to the want of concentration just referred to. As an instance may be quoted the extensive public health regulating powers contained in the Local Government Act. This Act is not within the direct administration of this department, and desirable supervision over the very valuable public health provisions of that Act can only he exercised by a roundabout and difficult process; more direct administrative authority by this department is essential.

Directions in which such control is urgently needed are the supervision of the appointment hy local authorities of their sanitary inspectors. The Local Government Act, it is true, gives the Board of Health the power to require local authorities to appoint a sanitary inspector if they have not already such an officer, but this provision can he easily evaded hy a mere nominal appointment on the part of local authorities. The Department of Public Health has no power to enforce the appointment of a competent officer for this important work.

Another direction in which important powers are lacking to the health authorities of this State is that of making regulations, particularly regulations for the control of infectious persons. Many of the other States of Australia are far ahead of New South Wales in this particular. In Victoria and Queensland the Public Health Department can make regulations for the effective control of " carriers " of infectious disease. One of the recent developments of sanitary science has been the discovery that certain persons, though not themselves suffering from any symptoms of an infectious disease, may nevertheless carry the germs of such a disease on or in their persons, and may infect other persons with whom they come in contact with the disease in a virulent form. Such individuals unless they are kept under some sort of control may become very dangerous to the public.

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There are other directions in which amendments of the Public Health Acts are urgently needed, and above all is essential the consolidation of all legislation dealing with the public health into one comprehensive Act. Any amendment introduced should aim at conserving and extending the elasticity of control of the public health by granting powers to the Board of Health to make regulations, rather than by the introduction of hard and fast legislative provisions.

Sanitary Condition of Hotels.

A special inspection was made of the sanitary condition of hotels, the chief defects disclosed were those relating to deficient lighting and ventilation of rooms; and, in the more outlying suburbs, unsuitable drainage systems. On service of notice these defects were in most instances promptly remedied by the licensee without the Department having recourse to further action.

Chemical Laboratory.

The work undertaken by this branch during the year comprised the testing of some 11,000 samples, consisting of milk and other foods taken under the Pure Food Act; food supplied to troopships; materials tested for the Stores Supply Department and other services, and medico-legal examinations conducted for the Police and Justice Departments.

There was an increase on last year's figures of all samples except milk. A notable example of this increase is shown in the number of samples of food taken from troopships, which amounted to 630, or more than double the number submitted in 1915. The value of the systematic inspection supplied to the transports is evidenced by the decided improvement in its quality, as the number of samples failing to comply with the requirements of the Pure Food Act fell from 20 per cent, in 1915 to just under 11 per cent. this year.

Several samples of drinks and cordials prepared and sold in country towns were found to be dirty and unfit for human consumption, owing largely to the lack of proper filtering apparatus. Owing to the Department's continued activities for the suppression of nostrums and "quack medicines," several prosecutions were undertaken against vendors of much-advertised "fat producers" and "flesh" reducers"; the proprietors of an appendicitis mixture consisting of cream of tartar, carbonate of soda, and tartaric acid; and a worthless cancer "cure" advertised and sold at 15s. per bottle. All of these so-called "cures" were the subject of careful analysis to ascertain their curative value, if any.

Dairies Supervision Act.

The Milk Supply is a subject which receives special attention from this office. Oversight of this very important food is secured under the Dairies Supervision Act, 1901, and by certain clauses of the Pure Food Act, 1908. Supervision of the milk supply begins at the dairy farm, where proper provision must be made for collecting and storing, and it is under control from that time until it reaches the consumer. Administration of the Dairies Supervision Act is vested in the local authority of each district—in the municipalities this is the Council; in places where there is no municipality, the senior police officer of the police district. These duties consist of keeping a register of all dairymen and milk-vendors, and inspecting each premises together with appliances and utensils at least four times a year. The Board of Health has its own dairy inspectors, consisting of a field staff of fourteen in the country, and one in the metropolitan area, who supervise as far as possible the work of the various local authorities. On account of the small staff employed it is not possible to compass this work in so complete a manner as the Department would wish. Any diseased animals discovered are destroyed under supervision.

Milk in transit to market is also kept under supervision, the Department insisting upon the absolute cleanliness of all milk receptacles of every description used by dairymen and milk vendors.

Upwards of 10,000 samples of milk are taken annually for analysis by the officers authorized under the Pure Food Act, from milk vendors in the metropolitan and country districts. In 1916 the number of adulterated milks was 516 out of a total of 8,493 samples examined. A number of samples referred to were taken in restaurants and refreshment rooms from the milk jugs served with tea and other beverages, and in a large number of instances this milk was found adulterated, in some cases the amount of added water being as high as 24 per cent. Proceedings taken resulted in fines ranging from £5 to £12 being imposed.

Milk Standard.—In dealing with milk there is another aspect which is of almost as great importance to the public as its purity, namely its value as a food. For a number of years the Health Department has insisted that the fat content of milk shall not be less than 3·2 per cent. Attempts have been made from time to time by certain sections of those interested in the milk trade to have this standard lowered, and pressure has been brought to bear with that object in view. The Department, however, has consistently maintained that 3·2 per cent. is not too high a standard. Its attitude in this respect is now being appreciated by many of those who formerly were most persistent in their efforts to secure acceptance of a lower fat content, as milk companies are paying higher prices for a richer article. Had the Department yielded to pressure and allowed the standard to be lowered, the only effect would have been to offer a premium to dairy farmers who kept herds producing a greater quantity of milk of a less nutritive character.

The Dairy Industry Act, 1915, administered by the Department of Agriculture dealing with the manufacture, sale, storage, transit, and export of

dairy produce was in operation during the year 1916, and the administration by two separate Departments has to some extent given rise to complaints in regard to overlapping of inspection by two different sets of officers. The advisability of arriving at some means by which this dual control can be obviated is too apparent to need comment, and an effort should be made so that those engaged in the dairy industry shall not be subjected to unnecessary expenditure as to which department's instructions shall be complied with in cases of doubt.

Meat inspection in country districts.—The inspection of meat in the Metropolitan and Hunter River districts is now controlled by specially appointed Boards. Outside these areas the Department continues its supervision over all meat slaughtered for food.

Pure Food Act.

A bulky volume would be needed to adequately describe the improvements secured by the Department in connection with food supplies in this State since the Pure Food Act came into operation in July, 1909. Inspectors at first directed attention to the gross adulteration of the more common foods which then existed. The revised code of regulations fixing legal standards for every article in general use came into force on 1st January, 1916, and is proving satisfactory. In the code referred to the Pure Food Committee endeavoured, as far as possible, to follow on the lines laid down by the interstate conference held in Melbourne in 1913.

Premises used for Preparing Food.

Since the passing of the Act a systematic inspection has been made of all premises used in connection with the preparation of food, and the clean and wholesome conditions now almost everywhere existing are a welcome evidence of progress when comparison is made with the laxly kept premises and insanitary conditions so frequently found six or seven years ago.

Bakeries.—All premises used for the preparation of bread and pastry are carefully inspected with beneficial results.

Manufacturing Confectioners.—The premises used for the manufacture of sweets, &c., have received detailed inspection. In a few instances the whole interior of the building, including walls, benches, floors, and utensils were in a dirty condition, and in several cases it was found necessary to take proceedings for insanitary conditions. Attention was also given to the fruit products used at these premises, and on several occasions traders were found using damaged and deteriorated fruits for trade purposes, evidencing the need for the strictest supervision being maintained.

Jam Manufactories were another class of premises which were systematically examined. Here also in a few instances very unsatisfactory conditions were found to exist, some of the largest traders being guilty of wilful neglect, not only in connection with the general condition of the premises, but also in regard to deteriorated food products stored thereon. Prosecutions taken resulted in the imposition of fines ranging from £5 to £30.

Fish and Small Goods Shops.—The sanitary conditions of these premises were examined and structural alterations made where necessary. In all cases where wilful neglect was apparent or dirty or insanitary conditions found, traders were prosecuted, and fined in sums ranging from £5 to £10.

Fruit Barrowmen.—Attention has been given to the exposure of fruit on barrows and elsewhere in the public streets, and in some instances barrowmen have been prosecuted for selling fruit unfit for human consumption. In the more flagrant cases the whole of their stock was seized and destroyed. It was occasionally found that dirty rags were used for the purpose of polishing fruit, and in one instance a trader was fined £2 and 6s. costs for using a soiled handkerchief for the purpose. Action is also being taken to stop the practice of "topping-up" fruit, and then selling an inferior article.

This branch initiated and energetically proceeded with the work of endeavouring to secure the removal from the market of all falsely described remedies and "cure-alls," several prosecutions being undertaken during the year.

Public Health and Sanitary Administration.

All matters connected with sanitation are immediately under the jurisdiction of the Deputy Director-General of Public Health who is furnished with a staff consisting of a Chief Sanitary Inspector and trained inspectors.

From the report of the Chief Sanitary Inspector it is evident that the amended Public Health Act has proved of great benefit in dealing with houses unfit for human habitation. The provisions of the amended Act have been availed of by many of the suburban and country municipal councils, and very little friction has resulted from their enforcement.

Nuisances.—A frequent cause of complaint is of nuisances arising from stables or from the keeping of poultry. It is hoped before long that legislation will be introduced which will provide effective means for suppressing or effectively supervising these and similar nuisances.

Rats.—Many complaints were made also by residents in the metropolitan district of nuisance caused by rats, and the attention of councils was invited to the provisions of Local Government Ordinance No. 39, which requires that the floors of produce stores, &c., shall be impervious to rats, and fixes penalties for allowing refuse or waste matter likely to encourage rats to visit or frequent premises, or to form or afford shelter or harborage for them; and councils were requested to take early measures to cope with the trouble.

Pollution of Ocean Beaches.—The firm action taken by the Department has resulted in a great diminution in the former pollution of beaches by garbage discharged from punts and sea-going vessels. Punts conveying garbage from the city are required to go at least five miles out to sea before dumping

their cargoes, and all garbage so dumped must be of a sinkable nature. Restrictions of this kind do not exist in regard to ocean-going vessels, and the Commonwealth authorities, whose jurisdiction extends three miles from the coast line, were requested to take measures to put an end to the practice followed by such vessels of discharging their refuse as soon as they cleared the Sydney Heads, thereby contributing largely to the pollution of the local beaches.

Garbage Tips and Destructors.—As a result of notices served and action taken by the Department, considerable activity has been exhibited by various suburban municipalities in an attempt to deal with garbage in a more satisfactory manner, and destructors have now been provided by Marrickville, Wookahra, and Paddington Councils. Several other councils have the question under consideration. In view of the financial position which exists at the present time, it would be advisable in many cases for two or three councils to combine and conjointly erect a modern destructor. This course was adopted many years ago by Petersham, Leichhardt and Annandale Councils, and has worked very satisfactorily. It has the great advantage of providing an efficient and economical service at a comparatively small cost to each of the councils concerned.

In general it can very truly be said that there has been a very great improvement in suburban garbage tips as compared with the conditions found existing when a systematic inspection was made in June, 1915, but strict supervision is still required in certain localities if gross nuisance is to be avoided.

Laundries.—During the year an examination was made by the Chief Sanitary Inspector of large and small laundry premises in the metropolitan district, and of the methods employed in sorting and disinfecting soiled clothing. Certain recommendations made in connection therewith are receiving attention.

Private Hospitals Act, 1908.

The year 1916 has shown several additions to the private hospitals already in existence. During the year several large premises situated in the metropolitan area have been entirely remodelled and fitted with every convenience, the results being very satisfactory. The increase in the number of cases of scarlet fever, measles, diphtheria, and infantile paralysis, again emphasized the need for establishment of private hospitals for well-to-do patients suffering from infectious illnesses. For lack of such accommodation persons residing at hotels or boarding-houses have frequently to be provided for at the Coast Hospital at great inconvenience to the Department, already overtaxed in finding beds for needy patients.

Infectious Diseases.

Typhoid Fever.—The behaviour of typhoid fever during the year was in marked contrast to that of diphtheria. There has been less typhoid fever in this State during 1916 than at any time during the last twenty years—year by year for some time this disease has been on the decline. This is highly satisfactory, as typhoid fever is one of the most serious of the common infectious diseases, and has in the past cost the State large numbers of valuable lives. This reduction is the outcome of the Department's insistence on local authorities enforcing effective sanitary measures in their districts, such as efficient sanitary and garbage service, cleanliness of dwellings and yards, properly protected water supplies, &c., and particularly by the increased vigilance in connection with the supervision of dairies and the milk supply generally. In many country towns where formerly there was a severe outbreak every summer, only three or four cases are now reported in the course of the year.

In this connection may be mentioned the report on typhoid fever issued in May, 1916, by the committee appointed to inquire concerning "Causes of Death and Invalidity in the Commonwealth," which concludes that the great and steady diminution in the typhoid mortality rate in the last thirty years is due to measures of sanitation, the principal factor probably being controlled disposal of human excreta. The committee, in pointing out that there still remains considerable typhoid mortality in the Commonwealth, particularly directs attention to the high rates in country districts as compared with the capital cities, and expresses the opinion that "the continuing loss of valuable lives every year from this disease is probably largely due to defective or incomplete application of recognized principles of sanitation; or to direct or indirect infection by infective humans (cases or carriers) probably largely by means of personal neglect of cleanliness, and by food infection."

Typhoid Fever at Broken Hill.—This year again there were a number of cases in this city which has been notorious as a hot-bed of the disease for a number of years. The department, both two years ago and again this year, offered the citizens of Broken Hill free inoculation against typhoid fever, but the offer was not taken advantage of. In another country town, Forbes, which has been badly affected with typhoid fever for several years, anti-typhoid inoculation has had a satisfactory result, the number of cases reported this year and in 1915 from Forbes having shown a considerable decrease.

In the metropolis an extensive outbreak of typhoid fever which occurred at Alexandria appeared to be chiefly due to total lack of sanitary precautions on the part of certain householders. Another outbreak occurred at Botany, and an investigation made by the Acting Medical Officer of Health points to the infection of the fifty-two cases which comprised the outbreak being due to a typhoid "carrier" case at a dairy in that district.

Diphtheria.—The incidence of diphtheria, which has been increasing steadily in New South Wales for eight years, was again higher than ever, and the number of cases notified, namely 6,588, was greater than that of any previous year. Towards the close

of the year there was some indication that the epidemic had begun to decline.

The disease was prevalent throughout the metropolis. It should be noted, however, that diphtheria is not one of those diseases which depends for its spread upon the prevalence of insanitary conditions. Like scarlet fever, it is a disease the infection of which is disseminated by personal contact. The infective germ of diphtheria may be carried in the throat of an individual who is not himself suffering in any way, but who is nevertheless liable to spread the infection.

Infantile Paralysis.—Quite a disturbing little outbreak of infantile paralysis occurred during the summer months—294 cases were notified, of which 181 were in the metropolis. This disease is a seasonal one, and affects people during the summer months, in opposition to cerebrospinal meningitis, which is chiefly a winter disease. Although the prevalence of the disease reached alarming proportions during one part of the summer, the outbreak never approached the intensity to which it attained in New Zealand, where, with a little above half the population of New South Wales, the authorities had to deal with over 1,000 cases.

During the epidemic a rumour caused many persons to think that infantile paralysis was a disease associated with the seaside. In order to establish the fallacy of such a belief, special investigations were undertaken by the medical officer of health. These fully demonstrated how erroneous the supposition was.

Cerebrospinal Meningitis.—The outbreak which began in 1915 continued during the current year, but with less severity than in the preceding year. To a great extent it was confined to those districts in the immediate vicinity of military camps; and in several instances in which outbreaks occurred in districts remote from such camps, infection was traced to soldiers who had visited the district a few days before. This is another of those diseases in which "carriers" are more numerous than persons actually suffering from the disease, and are probably in many instances the source from which infection is derived. During 1915 and 1916 outbreaks of cerebrospinal meningitis were common all over the civilized world, and New South Wales was not exceptional. The other Australian States also suffered considerably.

Small-pox

For the fourth year consecutively small-pox continued in New South Wales, but the epidemic showed evident signs of disappearance. No cases occurred in the metropolitan district after the middle of the year, and from September 19 there was a complete cessation of cases, the indications being that the epidemic was at an end. However, early in December a case was notified from Cooumble, and there is reason to believe that the disease had been lurking in the district known as the "Pilliga Scrub." The characteristics of the malady continued to conform to the mild type experienced from its first appearance in 1913. No deaths were recorded.

During the year several prosecutions were found necessary owing to neglect on the part of patients or their friends to notify that they were suffering from small-pox, or owing to careless exposure in public places of persons who were suffering from the disease. In four instances heavy penalties were inflicted by the magistrates.

One hundred and seven cases of small-pox were recorded for the year. The decline of the epidemic in this State was signalized on January 14 by the discontinuance of the medical inspection of Sydney passengers in the neighbouring State of Victoria; and all quarantine restrictions against Sydney were lifted in Samoa and Fiji on November 2.

Throughout the disease has continued to be the very mild type of small-pox introduced from Canada in 1913. It has proved itself to be no more deadly than chicken-pox, and its behaviour during a period of nearly four years makes it tolerably clear that no increase of virulence need be anticipated.

Lady Edeline Hospital for Babies.

During 1916 very good work in saving babies was done; 241 babies were treated, of whom 181 were discharged cured. The highest number in hospital —43—was in January, when there was an epidemic of gastro-enteritis of a very severe type.

In the summer of 1916, up to the end of December, there was very little gastro-enteritis as compared with the same period of 1915. This may be the result of the establishment of baby clinics in eleven of the more congested of the metropolitan districts. Nurses from these clinics constantly visit mothers, and impress upon them the importance of careful feeding and scrupulous cleanliness in rearing their babies.

By means of these district clinics the matron of the Lady Edeline Hospital is able to keep in touch with babies after their discharge from hospital. Many of the babies admitted to the hospital are sent in through the baby clinics, particularly cases of gastro-enteritis, bronchitis, pneumonia and malnutrition.

Convalescent Hospitals.

Over 1,000 patients have been admitted to these homes since they were established in 1914. The majority of the patients are received from the acute medical and surgical wards of the metropolitan hospitals. Occasionally subacute and chronic cases are admitted for short periods. In all cases the patients are greatly benefited by their residence at these hospitals, which is usually about four weeks, extensions being made for exceptional cases. Persons suffering from infectious or incurable diseases are not eligible for admission, as the homes are intended for patients convalescent from serious illness, or for those persons whose health has been seriously impaired or weakened, and who are likely to be benefited by rest and change.

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PULMONARY TUBERCULOSIS.

Tuberculosis was proclaimed in 1915 a notifiable disease in the Metropolitan and the Hunter River Combined Districts, from August of that year, and regulations were issued for its control there. These districts embrace the two largest centres of population in the State, and include the greater number of consumptives. The object in confining notification to these areas was to ascertain in the first instance how the Act and Regulations operated, as the wish was to avoid inflicting hardships upon those members of the community who had been so unfortunate as to contract the disease. As a result of the experience gained, operation of the Act was extended to the Blue Mountain Shire and Katoomba Municipality from October 2, 1916, as these districts are the resort of a large number of consumptive persons. So far no complaints have been received of any harshness caused in the administration of the Act, and considerable progress has been made in safeguarding the public from the likelihood of acquiring infection. When conditions become more settled it is proposed to extend the provisions of the Act to the whole State.

It is proposed to establish a central bureau under this department, which would either see or would have medical evidence before it in regard to all notified cases of consumption. It could then arrange for treatment of the more advanced cases in one institution, whilst other less advanced cases holding out more hope of complete cure could be accommodated in sanatoria elsewhere. Patients well on the road to recovery could be occupied outside of institutions in selected districts where the conditions appeared to be such as would expedite their restoration to normal health.

This classification of cases is a matter of very great importance, for, as emphasized by Dr. H. W. Palmer in his report on Waterfall Sanatorium, the gradual collection there of a large number of advanced cases prevents the institution from carrying out its true functions, namely, the providing of early care and attention for patients who under such conditions have a prospect of more or less complete recovery. He again points out that hopeful cases cannot be satisfactorily or economically treated alongside dying patients, and that as the latter become more numerous favourable sanatorium conditions become more and more impossible.

In fighting consumption the principal weapons are: First, education of the public to the dangers of the disease, and the necessity for personal hygiene. Secondly, compulsory notification and registration of all cases of tuberculosis to permit of surveillance in order that the danger of spread of infection by them may be reduced to a minimum. Thirdly, provision in suitable localities of sanatoria for the treatment of early cases or recovering cases of the disease. Fourthly, provision for the chronic incurable cases in special hospital near the city, where they can be frequently visited by their relatives and friends.

MICROBIOLOGICAL LABORATORY.

A very large number of examinations were made in connection with typhoid fever and malaria. In addition a large number of tissues were examined for cancer and other disease processes, whilst foods and disinfectants of various kinds have been submitted from time to time for bacteriological examination. A large number of vaccines were also prepared for human diseases for curative purposes, the results in some cases being very striking.

Dengue Fever.—Probably the most important work carried out by the laboratory during the year was an investigation into the means of spread of dengue fever on the north coast of New South Wales. By means of mosquitoes caught in the infected area and transmitted to Sydney, the disease was conveyed to four individuals in Sydney, thus establishing the fact that dengue is spread by the yellow fever mosquito *Stegomyia fasciata.* Though dengue does not occur in Sydney, its occurrence in epidemic form in our northern coastal towns leads to great disorganization of business and much commercial loss. Now that it is known definitely that the yellow fever mosquito, *Stegomyia fasciata,* is a transmitting agent, systematic measures may be adopted to destroy the breeding places of this pest and to prevent its entrance into houses. In this way, with intelligent co-operation between municipal authorities and the public, the occurrence of future epidemics of the disease should be capable of prevention.

Anti-typhoid Vaccine.—During the year anti-typhoid vaccine were prepared and supplied chiefly to the military authorities. The value of this protective measure is hardly realized by the general public, and it is regretted that so few country towns have accepted the department's offer to supply sufficient anti-typhoid vaccine to protect all the inhabitants of the district. In those districts which did accept the offer there has been a great diminution in the yearly number of typhoid cases.

VENEREAL DISEASES.

This important subject has had the department's most serious attention, and a Select Committee has been appointed by Parliament to inquire into the best method of combating them.

To persons not acquainted with the difficulties of such a course notification seems to possess the most effective first measure to be adopted, but the English Royal Commission on Venereal Diseases, which presented its report in 1916, took a great deal of evidence bearing upon notification, and after the most careful and even anxious consideration members of the Commission unanimously decided not to recommend any system of notification, even of a confidential nature. In many quarters this decision caused great disappointment. The chief reasons to be urged for and against notification are that it has been applied to one infec-

tious disease after another, with great benefit to the public health in such diseases as typhus and typhoid fever, small-pox, scarlet fever, and diphtheria. In tuberculosis also it is proving of great value. Notification tends to check the dissemination of these diseases, because it affords the opportunity of isolation of cases of acute infectious fevers such as scarlet fever; which can he arranged for, either in a fever hospital or at the patient's own home, and, if necessary, certain measures of isolation enforced respecting those who have heen in contact with such cases; also on recovery of the patient measures of disinfection are duly carried out.

Such measures are not applicable to venereal diseases, as these diseases are not infectious in the sense in which epidemic fevers are. Venereal diseases are *contagious*, the infection is not diffusive, is neither air-borne nor water-borne, and while it is necessary that the patient in the infective stages should avoid certain kinds of physical contact, and that articles contaminated by him, such as drinking vessels, should not be used by others, there is no need for isolation, which is frequently as impracticable as it is unnecessary. Nor is disinfection applicahle to venereal diseases, for it is the patient who needs to be disinfected, not his surroundings, and the only way of disinfecting him is to cure him. This can only be accomplished hy rendering accessible to him the best means of treatment, whatever his circumstances, and hy bringing him to realize the grave and irremediable consequences of neglecting to use them. To attain these ends the patient must feel assured that the nature of his complaint will he kept secret.

The most effective method of dealing with these diseases will he by obtaining the co-operation of public hospitals throughout the State in regard to treatment of such patients, and measures in this direction are in contemplation.

I am convinced that the difficulty is not in inducing persons suffering from these diseases to suhmit themselves for treatment, but in securing the co-operation of hospitals, and provision of funds for the establishment of clinics for their treatment in convenient and suitable localities.

Mosquitoes and Spread of Diseases.

The introduction into New South Wales of several cases of malaria by means of returned soldiers, the opening of the Panama Canal, where yellow fever is endemic, and the occurrence on the northern rivers of an outhreak of dengue, focused the attention of the department upon mosquito-borne diseases, and it has in conjunction with the local Government department formulated a code of ordinances under the Local Government Act, which enables a municipality to enforce an anti-mosquito campaign within its district.

Curing Wounds by Open-air Treatment.

The department by circulars directed the attention of the various country hospitals to the success obtained from the open-air treatment of wounds.

Sir Almroth Wright, Consulting Physician to the British Expeditionary Forces in France, has demonstrated during the war that septic wounds improve rapidly with open-air treatment, and the climate here is even more suitable than the climate of England for the carrying out of such treatment. The "First Eastern General Hospital," at Cambridge, was specially designed for the carrying out of such treatment, and the building is a very inexpensive one, as each ward has only three walls, the fourth side heing open to the weather, and even the back wall has a large aperture protected by louvres to enable a very free circulation of air.

Adulterations.—These included some curious examples, a few of which may be considered of sufficient interest to mention here. A ground coffee submitted was found on examination to consist largely of roasted heans or peas; a sample of pepper contained as high as 60 per cent. of ground shell or stones from some fruit or other seed; and a "hlackberry" jam contained no blackberries whatever, but consisted of apple pulp artificially coloured.

Many of the cordials and soft drinks prepared and sold in country towns were found to be so dirty as to be unfit for consumption. This was probably largely due to the lack of efficient filtering apparatus.

A great many drugs, patent medicines, pills, &c., were examined during the year. Several much-advertised "flesh-formers" and "fat-producers" were proved to be worthless for the purposes for which they were sold. A couple of astonishing examples of the effrontery of the people who advertise and sell "cure-alls" were found in an "appendicitis cure," which was prepared from a mixture of cream of tartar, carbonate of soda, and tartaric acid; and a cancer cure, sold at a high price, which consisted simply of a weak solution of chloride of gold.

An article of especial interest suhmitted by the military authorities was an alcoholic liquid equal in strength to rum, which had heen prepared by a member of the German Concentration Camp by means of an illicit still made in the camp itself.

An interesting investigation was carried out with the object of ascertaining the radio-activity of the Moree Artesian Bore water. This water flows from the bore with a temperature of, approximately, 112° F., and is used in the baths for the treatment of various complaints more or less of a rheumatic character and for stiffness of the muscles and joints. It is reputed to be very efficient for this purpose, and it has been suggested that its efficacy is partly due to the presence of radio-active matter. The result of the examination showed that the amount of radio-active substance per litre of water was equivalent to that derived from one ten-millionth of a milligram of radium.

The most interesting of the criminal investigation cases were those suhmitted in connection with the I.W.W. charges, for which ahout twenty different exhibits were examined. The articles used for incendiary purposes consisted of cotton waste im-

pregnated with nitre, the ignition being caused by the application of a mixture of carbon-bisulphide and turpentine containing phosphorus in solution. The majority of the deaths by poisoning investigated were found to be due to the use of strychnine. One case recorded was due to oxalic acid, and another remarkable case was that in which a woman died from drinking ordinary bottled beer which contained potassic cyanide. No evidence was adduced to show how the cyanide found its way into the beer.

THOMAS COOKSEY,
Government Analyst.

PURE FOOD ACT, 1908.

Milk Supply.—The supervision of the handling and distribution of milk has received particular attention. About 8,262 samples of milk have been procured from milk vendors, all of which have been tested by the Government analyst. Special inspections have also been made of premises used for the storage and distribution of milk. In this connection may be mentioned the action taken during the past twelve months against the keepers of restaurant and refreshment rooms for serving milk to customers, either for drinking or for consumption with other beverages, adulterated with large percentages of water.

Milk Receptacles.—Attention is constantly given to the state of cleanliness of milk receptacles used by dairymen and milk vendors. One practice that the department is determined must cease is the use of rusty and worn-out lids, under which rags are frequently placed to prevent leakages. Wherever this insanitary condition has been found, the receptacles have been seized by the Pure Food Officers and destroyed, proceedings also being taken against the users. Occasionally it has been found that traders had stopped the holes in their cans with rags, soap, or similar material.

Bread.—The subject of bread delivery and the premises of manufacturing pastrycooks has received special attention, a thorough inspection being made of all such premises. In many cases, it was found necessary to prosecute traders in a large way of business.

The question of bread delivery also received attention, and has resulted in very great improvement. Prosecutions were taken on several occasions against careless carters for failing to protect bread from dust whilst delivering to customers. The former general practice where carters carried bread on the footboard of their carts within a few feet of the horse, and unprotected from dust, has now almost wholly ceased. The regulation dealing with this subject provides that all food consumed in the same state as it is sold shall be at all times protected from flies and dust until delivered to the purchaser.

Damaged and Deteriorated Food.—Special examinations are made of food-stuffs exposed for sale in auction rooms, elsewhere by auction, and also of salvage goods. This close supervision is essential from the fact that it is frequently foods damaged by fire or water which are disposed of in this manner. During the year the officers of this branch have examined many tons of assorted groceries in auction rooms and elsewhere, with the result that the following, among others, have been seized and destroyed: Mixed groceries, preserved fruits and dates, butter, salted fish, flour, salt, rice, sugar, tomato pulp. Other articles of food seized and destroyed included meat, vegetables, 13,198 tins and 58 cases of fish, 702 tins and 83 cases of preserved fruits, and 36,067 bottles of patent medicines.

This work is of special importance, for it is safe to say that prior to the passing of the Pure Food law such goods found their way to the cheaper restaurants or to sauce, jam, or pickle factories. The examination of salvage goods from one fire alone necessitated a considerable amount of work and resulted in over 50 tons of damaged food-stuffs being sent to the garbage tip. Included in the condemnations were 31 tons of dried fruits, 13 tons of tea, $1\frac{1}{4}$ tons of breakfast foods, and 50 cases, 2,500 boxes, and 698 tins of other assorted groceries.

Ice Cream and Ices.—During the year there have been several inspections of premises where ice cream is prepared, resulting in the prosecution of some eighteen traders for selling adulterated ice cream. The examination showed that the "ice cream" was either deficient in milk-fat, or was the article commonly known as "ices," fraudulently sold as "ice cream," there being a distinct difference between the two articles.

Premises Used for Preparing Food.—During the year inspections have been made of factories and other premises used in connection with the preparation and storage of food. Many traders have been prosecuted for not keeping their premises in a cleanly and sanitary condition, and have been fined.

Fruit Barrowmen.—Prosecutions were taken against barrowmen who were found selling fruit unfit for human consumption. In some cases the whole of their stock was seized and destroyed. During these inspections it was noticed that dirty rags were used for the purpose of polishing the fruit; and in one instance a trader was found using a soiled handkerchief.

The fraudulent practice of "topping up" fruit must be stopped. In many cases it was found that traders were exhibiting a good quality of fruit, and selling fruit which was decomposed and unfit for consumption.

Manufacturing Confectioners.—A detailed inspection has been made of premises used for the manufacture of sweets and confectionery; at a few premises the whole interior of the building, including walls, benches, floors, and utensils were found in a dirty condition. Attention has also been given to the fruit products used in such manufacture, and many traders were found using damaged and deteriorated fruits for trade purposes.

Jam Manufactories.—In a few instances very

unsatisfactory conditions were found to exist, some of our largest traders being found guilty of wilful neglect, not only in connection with the general condition of the premises, but also in regard to deteriorated food products stored thereon.

Fish and Smallgoods Shops.—The sanitary condition of these premises received considerable attention, and many notices were served requiring structural alterations; where dirty and insanitary conditions were found the traders were prosecuted.

Falsely described Remedies and "Cure-alls."—Four traders in a large way of business, making a speciality of so-called "flesh foods," were proceeded against for selling "flesh-forming tablets." Medical evidence was produced, and the proprietors were fined.

Another "herbalist," advertising a so-called blood purifier, claimed to have cured hundreds of patients suffering from various diseases. This man was fined for selling a falsely described article, and also for manufacturing drugs under filthy conditions.

Food Inspection on Transports.—Stores and food supplies on every transport which has left New South Wales during the year have been examined, and, where necessary, seized and removed when unfit for consumption. The result of this inspection has been very beneficial, for in no instance has it been necessary to take legal proceedings.

ARTHUR KENCH,
Chief Inspector, Pure Food Branch.

CATTLE SLAUGHTERING AND DISEASED ANIMALS AND MEAT ACT, 1902.

During the early part of the year pleuro-pneumonia was very prevalent among dairy herds, but owing to the action of the Dairymen's Association in arranging for their secretary to inoculate all cows on dairy premises, it has now practically been stamped out. All the cows at the institutions under the supervision of the Board of Health have been inoculated.

Contagious mammitis is now making headway among dairy stock, and arrangements are being made to cope with this outbreak of the disease. Veterinary officers of the Meat Industry Board report large numbers of affected cows passing through Flemington sale-yards. Should the disease become prevalent a very serious state of affairs will arise as the city's supply of fresh milk will be appreciably affected.

REPORT OF THE CHIEF SANITARY INSPECTOR.

Several small outbreaks of infectious diseases occurred during the year. A young man who was suffering from scarlet fever at a private hospital in the metropolitan area left the hospital while still infectious and visited a friend, who was enjoying a holiday with his family at a seaside resort. A young daughter of the family contracted the disease. On receipt of complaint the matter was investigated, and the young man prosecuted by the inspecting officer for exposing himself in a public place while suffering from an infectious disease, and fined.

As instances showing the effectiveness of enforcing sanitary measures such as efficient sanitary and garbage services, improved water supply, proper construction of closets, cleanliness of dwellings and yards, protection of food from dust and flies, storage and removal of manure and other waste matter, &c., it might be mentioned that several country towns where typhoid fever was usually prevalent in summer months are now comparatively free from that disease.

With a view of inducing the residents to realize the importance of systematic destruction of flies, several local authorities are giving much publicity in their districts to the part played by house-flies in spreading disease, and the measures to be taken for control and eradication of the pest.

At Narrabri the local sanitary inspector refused to be vaccinated, and as his work included disinfection of infected premises he contracted small-pox. Before going to the hospital, however, and while in an infectious state with the rash well-developed, he continued to carry out his usual duties in addition to acting as ticket collector at a concert held at the Town Hall. When the matter was reported to the Board, the Chief Sanitary Inspector was instructed to prosecute, and the local council's inspector was fined for exposing himself while suffering from an infectious disease. Another local resident who contracted small-pox and escaped from the hospital one night to visit his friends, was prosecuted on the same day and fined on a similar charge.

The number of rats caught on the wharves from fumigated ships and similar sources totalled 7,943. All rats caught were examined at the Microbiological Laboratory, and none found infected with plague.

PRIVATE HOSPITALS ACT, 1908.

No private hospital is now allowed to be carried on until there has been a proper inspection of the premises and investigations made as to the suitability of the proposed licensee and resident manager. All private hospitals throughout the State are subject to inspection at all times by an officer authorized by the Board of Health.

When this Act first came into operation it was recognized by the Board that a certain amount of consideration had to be given to persons who had conducted such an establishment for perhaps many years prior to the passing of the Act; but since July 1, 1910, the Department insists that as far as possible premises shall be structurally suitable, and that the resident managers shall comply with the requirements as to personal qualifications.

During this year, owing to the scarcity of trained nurses, arrangements slightly less strict have been made in order that hospitals already established shall be conducted under the circumstances as efficiently as possible. These arrangements are only temporary, and as soon as possible reversion will be made to pre-war conditions.

Colonial Medical Reports.—No. 109.—New South Wales (*continued*).

The police were frequently called upon to inspect hospitals and submit information concerning them in accordance with a detailed report supplied by this Department, pending a visit from a medical officer of the staff. In the metropolitan area many of the hospitals have been inspected, and also those in some country towns when opportunity offered.

Hospitals in which a septic puerperal case has occurred are prohibited from receiving any additional lying-in case, pending the enforcement of certain regulations; as a consequence, no second case was infected in any hospital.

All births and deaths which occur in private hospitals must be reported within twenty-four hours. Further, in compliance with the definition of birth, all miscarriages or stillbirths are reported.

Very few infectious cases are received by private hospitals owing to the necessity for the provision of a building approved by the Board. There is doubtless room for hospitals suitably equipped for these cases in many large country towns, but the demand is especially insistent in the metropolitan area.

Metropolitan Combined Districts of Sydney.

The population of the metropolis proper (Sydney and suburbs) was estimated by the Government statistician to be 764,600 on December 31, 1916, of which the City of Sydney contained 106,000, and the suburbs (including the shire of Kuring-gai) 658,600.

The mean population for the year was estimated to be 763,800. In this report the estimated population figures have only been departed from in the municipalities of Hunter's Hill and Letchhardt, since each contains large mental hospitals. As in former reports, deaths among inmates of these hospitals have been distributed to the districts in which they had previously resided, and consequently it was necessary to exclude such inmates from the estimate of the population. The hospitals in question were Gladesville (1,257 inmates) and Callan Park (992 inmates).

The number of births registered in the metropolis during the year was 20,856, equivalent to a rate of 27·31 per 1,000 of the population. The number of births was fifteen below that of the year 1915, which was the highest ever recorded in the metropolis. The rate is 4 per cent. below the average of the preceding five years, and is the lowest since 1910.

The number of illegitimate children born during the year was 1,334, or 6·40 per cent. of the total births, and equivalent to 1·75 per 1,000 of the population. Of these children, 57·6 per cent. were born in public institutions.

The recorded deaths of residents in the metropolis, after correction for institutions, totalled 7,800, equivalent to a rate of 10·24 per 1,000 of the population. This rate is 2 per cent. below the average of the previous five years.

Meteorology.

The mean temperature of the air in Sydney during 1916 was 63·4 degrees Fahrenheit, which is 0·4 degrees higher than the mean of fifty-seven years' observation. The mean temperature was above the average, except in the months of March, April, October, November, and December. January, February, and December were the warmest months of the year, whilst July was the coldest.

The rainfall for the year was 3·161 inches below the average of fifty-seven years. The months of April, September, October, and December showed a rainfall above the average, October exhibiting by far the heaviest rainfall of the year.

Scarlet fever was most prevalent in the months of May and August, and least so during the months of June and December.

Diphtheria was slightly more prevalent in 1916 than during the previous year, the attack rate being 3·39 per 1,000 of the population. The monthly numbers of cases notified were highest in March, April, and May and lowest in October, November, and December.

Typhoid Fever.—The largest number of cases reported for any municipality during the year was eighty-three from Alexandria.

This outbreak was, in my opinion, due to grossly insanitary conditions in certain streets of the municipality, caused chiefly by the utter lack of sanitary sense on the part of inhabitants. Energetic action was taken by the local sanitary inspector with most beneficial results.

Fifty-two cases were notified from the municipality of Botany, and, in my opinion, many of these were due to infection from the dairy conducted by Mrs. D——, owing to the presence of another carrier on the premises. (This dairy was the cause of an outbreak in the previous year.) It is interesting to note that as the result of the vacation of this dairy by certain members of the family the cases decreased in numbers. However, the family concerned moved to the municipality of Ryde on ceasing to reside at Botany, with the result that a small outbreak occurred in Ryde. On investigation, this second carrier was detected and removed from the district with dramatic results in the decline of the number of cases. This carrier is being kept under observation, and strict precautionary measures have been taken with respect to such person.

Tuberculosis.

The number of deaths from all forms of tuberculosis in the metropolis proper during 1916 was 558, of which 489 were due to tuberculosis of the lungs, 29 to tubercular meningitis, and 40 to other tubercular diseases. The total does not include 65 deaths from phthisis which occurred in the Benevolent Asylums, all former metropolitan residents. When these figures are included the total deaths from phthisis for the year were 623.

Infantile Paralysis.

This disease occurred in epidemic form in New South Wales during the early part of the year, resulting in the notification of 186 cases within the metropolitan area for the year 1916, which is by far the largest number reported since the disease was declared a notifiable one.

The epidemic actually began in December, 1915, and persisted through 1916 during the months of January, February (maximum), March, and April. A rapid decline occurred in the months of May and June, subsequent to which months the epidemic practically ceased.

The press gave prominence to the epidemic, and numerous theories as to the causation of the disease were put forward, one of which sought to implicate more particularly the marine suburbs and the practice of sea-bathing. As the result of a special investigation made in connection with each case reported in the metropolitan area, the above theory could not be substantiated.

Features of interest in connection with the epidemic were the facts that the rainfall during the months of January, February and March was below the average, and that the mean temperature in the shade was above the average during the months of January and February. It will thus be seen that the epidemic was at its height during a warm, dry and dusty season.

Outbreak of Mild Small-pox in New South Wales.

During 1916 New South Wales continued to be affected by the mild type of small-pox which was introduced from Canada in 1913. The outbreak steadily declined throughout the year.

A question which here presents itself as worthy of very serious consideration is the following: Are the health authorities of New South Wales justified in further maintaining their attitude of special watchfulness against this particular form of small-pox; is it necessary or desirable to continue the campaign, which it must be remembered is a fairly expensive one, against a disease which is after all no more deadly than chicken-pox? For that is the plain truth about this particular type of small-pox, which invaded New South Wales in 1913, and is still existent in some parts of the State. Among the 2,275 cases which have come to the knowledge of the authorities up to the close of the year 1916, there have been but four deaths recorded, and in each of these four instances there was some other condition existiug concurrently with and independent of the disease small-pox, which was in itself sufficient to account for death.

At the time of the first introduction of the disease, and for many months afterwards, there can be no question that the proper attitude of the health authorities was that actually adopted by them. The disease responded to every clinical and scientific test for small-pox which could be applied to it. It was, in fact, small-pox, and although after a few months the fact emerged that the type of the disease was extraordinarily mild, the authorities were by no means convinced that it would continue so.

But the behaviour of the disease during a period of nearly four years has made it tolerably clear that no increase of virulence is to be reasonably anticipated. The epidemic of small-pox in New South Wales to-day is as regards virulence and clinical features unaltered from the type of the disease that was introduced early in the year 1913.

The principal arguments which justify a continuation of the efforts of the health authorities to stamp out this disease may very briefly be stated. In many instances the effects of attacks of this mild form of small-pox have been very disfiguring. Except in the mildest cases the complexion and features of women who have undergone attacks have been permanently disfigured in a greater or less degree. The disease also tends to produce abortion when it attacks pregnant women. Add to these facts that the eruption is a very loathsome one, and that a great deal of pain and discomfort precede and accompany an attack, and a fairly good case emerges for the enforcement of strong repressive measures. Finally the attitude of the adjoining States of the Commonwealth has no little bearing upon the question. They have all apparently escaped infection so far (probably because they are better vaccinated than New South Wales), and they are naturally apprehensive of invasion from this State, and would strongly resent any slackening of the precautions which are being taken to check and limit the spread of infection here.

The supply of anti-typhoid vaccine for military purposes was continued as previously, and the protective value of this vaccine appears to have been very satisfactory.

Actinomycosis.—One of three specimens consisted of an actinomycotic abscess in the submaxillary region of a cow. The second case consisted of lesions in the face of a human being strongly suggestive of actinomycosis; the result was negative. The face was greatly disfigured by extensive tunnelling sinuses discharging watery pus. There was much induration and a reddish discoloration over the bridge of the nose, the sides of the face, neck, &c. The bridge of the nose was depressed, which the patient said was the result of a blow in boxing. There was a strong ozæna smell. Cultures revealed the presence of ordinary pyogenic organisms and a vaccine made from these very greatly ameliorated the condition of the patient. It seems clear, therefore, that there could have been no actinomycotic basis in the case. The third case was pus from the rectum of a youth which also proved negative.

Anthrax.—Specimens from six suspected cases of anthrax in man were submitted. The materials from four cases proved negative. In the case of a typical malignant pustule from the right forearm, which developed in a man employed at a hide and wool store in Sydney, anthrax bacilli were detected. In another specimen diagnosed as a malignant pustule, received from Tamworth in February, microscopic sections showed a number of anthrax bacilli.

Favus.—This consisted of a mouse forwarded from Coonabarabran. There were extensive favus cups on the left side of the head.

Malaria.—A number of blood films were submitted from persons who had returned from malarial districts, and had symptoms suggestive of the possibility of the continuance of a previous malarial infection. In a certain number of cases, the individuals concerned were desirous of enlisting, but having been previously in a malarial district, examination of the blood was required before acceptance. Though examinations in these cases might prove negative, and yet the patient still have a latent infection, these examinations were conducted in the hope that some at least of such infections might be detected. Thirty-two of the total cases proved negative, and five showed the presence of malarial parasites. Of these five cases, one had contracted the disease at Rabaul, New Guinea, eighteen months previously and had been away from the Tropics for ten months. A second case contracted his disease in the Solomon Islands; a third, in which crescents were numerous, was infected in the Northern Territory; a fourth case was a woman who received the infection in Malaya—she had been away from a malarial district for four months—whilst there her husband had contracted malaria, but she herself had not manifested any signs of the disease until after she had left the district.

Tetanus.—Of three cases in which tetanus was suspected, the organism was found and grown from one, the specimen having been taken from a wound in the foot. Tetanus bacilli were not detected in the other two cases.

Tinea.—Tinea versicolor was found in the scales from the chest of a patient. In the other case snippings from the nails did not reveal the presence of fungal hyphæ.

Researches on Plague.

In connection with routine measures taken for the detection of the presence of plague and the prevention of its spread, 7,943 rats and mice were examined during 1916. Plague was not found in any of the specimens. The last plague-infected rat was found at Sydney in April, 1910.

Species of Fleas.

The fleas collected were determined as belonging to four species: *Xenopsylla* (*Læmopsylla*) *cheopis*, *Ctenopsylla musculi*, *Ceratophyllus fasciatus*, and *Ctenocephallus felis* (or *canis*).

Examination of Rats.

The report of a second outbreak of plague at Sydney, 1902, contains the following statement referring to all rats examined during the first and second outbreaks of plague in 1900 and 1902 respectively:

"All the rats received belonged to one of two species—*Mus decumanus* and *M. rattus*. No record was kept of the actual number of each. In the whole collection there were about as many of one as of the other; but *M. rattus* predominated among those taken along the shores, and *M. decumanus* among those taken inland. The infected specimens were all *M. decumanus*."

Typhoid Fever.

Widal (Agglutination) Reactions.

This reaction was performed on 718 specimens of blood from 700 different cases during the year. Of this number 211 were complete positives, while 36 showed strong, but not quite complete, agglutination. Taking these two results together the percentage of positive results to the total number of specimens examined was 34·3 per cent.

In a number of cases, when the diagnosis was obscure, the reaction was repeated, generally after a week's interval. As a routine procedure, when the result was incomplete, a fresh specimen was asked for—in many cases these were not forwarded.

In addition, three specimens were received, one of which did not contain sufficient blood to enable an examination to be performed, and the other two arrived in one box with no marks for identification. Apparently so far we have no evidence that paratyphoid fever is endemic in Australia, or that some cases diagnosed as typhoid fever are really instances of this disease. Occasionally sporadic cases do undoubtedly occur. This matter is worth much fuller investigation, as unquestionably the data in our possession are too small to allow of anything beyond a somewhat vague generalization.

In the case of agglutination reactions with *B. paratyphosus* A we first used dilutions of 1 in 60, but later in the year, owing to the agglutinating titre of this organism being often low, we instituted a dilution of 1 in 10 for routine purposes.

Cultures.

Cultures were made from urine, fæces, blood, water, milk, pus, &c., and *B. typhosus* searched for.

Urine.—Seventeen routine specimens were examined, with one positive and twelve negative results. From one specimen an organism was isolated which gave the positive sugar reactions, but did not agglutinate the stock vaccines. From three specimens no growth was obtained. Thirteen military cases were all negatives.

Fæces.—Twenty-one routine specimens were examined. *B. typhosus* was detected in one case, on November 30, the blood from which gave a negative Widal reaction on November 27, and a positive one on December 14. Three of the above specimens were also examined for *B. paratyphosus* A and B, giving negative results in each case. In thirty-two military cases no *B. typhosus* or *B. paratyphosus* B were detected. In one an organism giving the biochemical reactions of *B. paratyphosus* A was isolated—this gave imperfect agglutination at 1 in 60 with the only *B. paratyphosus* A serum available, which was of unsatisfactory titre, even against

stock cultures, and it gave a negative reaction at 1 in 60 with *B. paratyphosus* B serum.

Drainages from Gall-bladders.—Two specimens from the same case were examined at an interval of fourteen days. The first specimen yielded an organism in its suger reactions like *B. typhosus*, but of doubtful agglutinability. The second specimen failed to yield *B. typhosus*. The patient gave no history or symptoms of typhoid fever.

NOTE ON A TYPHOID CARRIER WITH LARGE NUMBERS OF B. TYPHOSUS (?) IN THE STOOLS FOR SEVERAL YEARS.

Although this case has not been the subject of complete bacteriological and other investigations, the short notes collected from numerous routine examinations conducted in the laboratory are interesting from several points of view.

The first case came under our notice in January, 1915. He was a patient in one of the mental hospitals. At this institution there had been a small outbreak of typhoid fever and the present case, a male, aged 53, was suspected and found to be a carrier. There was a history of typhoid fever seven years before.

He was transferred to the Coast Hospital and during the subsequent three years his stools have been submitted for examination fifty-six times. Except on one occasion when no *B. typhosus* was found, possibly due to some other organisms overgrowing the plates, *B. typhosus* has always been present in large numbers.

We have not always fully tested the organism, relying on the extremely characteristic fine "blue" colonies on agar plates, but periodically these colonies have been more or less fully tested and when so tested always gave the reactions of *B. typhosus*.*

The culture when first isolated by us from this case produced acid only on glucose mannite, sorbite, and litmus peptone water, and produced no change on dulcite, lactose, cane sugar, and arabinose, and produced also slight acid on milk and gave a negative indol test. These reactions were read after four days' incubation. The cultures subsequently obtained whenever tested gave similar reactions although not always tested so completely.

The urine of this case tested on one occasion contained no *B. typhosus*.

With the kind co-operation of Dr. Wallace, the Acting Medical Superintendent of the Coast Hospital, it was decided to make an endeavour, by therapeutic means, to diminish or eliminate the number of typhoid organisms excreted in the fæces of this patient. With this object in view various drugs were administered, and milk, soured with lactic bacilli (butter starters) administered in the diet. The drugs tried were hexamin, mercury, and betanaphthol with bismuth salicylate. In no instance did the various courses of treatment appear to have any effect on the number of typhoid colonies present.

* The agglutination reaction was atypical.

Hexamin.—Though this drug is only supposed to liberate formaldehyde in an acid medium, and therefore would not be expected to be active in the presence of alkaline bile, it was, nevertheless, tried on the off-chance of meeting with conditions under which it might be operative. From January 29, 1915, to May 15, 1915—a period of about three and a half months—5 gr. were administered three times a day. The drug was discontinued until September 10, 1917, when a course of 15 gr. four-hourly was again instituted.

Mercury.—As mercury is a cholagogue purgative it was thought that if it was administered over a period of time in doses approximating as nearly as possible to the amount that would lead to salivation, but without actually reaching this limit, it might be excreted in the bile in sufficient concentration to exert a deleterious effect upon the typhoid bacilli present. It was presumed that in this case in all probability the gall-bladder formed a reservoir for the typhoid organisms, and thus kept up the number of typhoid bacilli found in the fæces. With this object in view, one-sixth of a grain of calomel was given three times a day from January 29, 1915, to May 15, 1915. The same dose was given again from May 31, 1915, to June 9, 1915, and from August 11, 1915, to September 13, 1915; ½ gr. three times a day was administered from November 4, 1916, to January 6, 1917. From June 9, 1915, to June 26, 1915, a mixture containing liq. hydrarg. perchlor. 1 grm., and quin. sulph., acid sulph. dil. and aqua chloroformi ad 4 oz. was given, the dose being ½ oz. three times a day.

Betanaphthol and Bismuth Salicylate. From August 12, 1915, to November 4, 1916, a powder consisting of 10 gr. of each of these drugs was administered three times a day.

Sour Milk (Lactic acid bacilli).—The alleged properties of milk soured by lactic acid bacilli in controlling bacterial processes in the intestine suggested its application to the present case. A 6-oz. medicine bottle full was given daily for about six weeks from March 3, 1915, and it was administered again for a few weeks from June 26, 1915.

Agglutination reactions have been performed with the cultures and with the blood of this case on several occasions, but as we intend to investigate this matter fully it will not be discussed in detail here. It will be sufficient to say that so far they are most contradictory.

The principal interest in the present communication is found:—

(1) In the persistent and constant presence in the stools of a bacillus closely resembling, if not identical with, *B. typhosus*.

(2) In the fact that the typhoid bacilli usually outnumber, and often greatly outnumber, the colon bacilli.

(3) The apparent long duration of the carrier condition.

The patient physically enjoys the best of health and is a voracious feeder.

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DIPHTHERIA.

Routine Examinations of Swabbings.

During the year, 1,925 swabbings were examined in ordinary routine for the presence of diphtheria bacilli. In addition, 849 swabs were received from boys on the training ship *Tingira*.

The 1,925 swabs were received from general practitioners in the neighbourhood of Sydney and in the country, from the smaller hospitals, more especially country ones, and occasionally for diagnostic purposes from small institutions, soldiers in camp, &c.

The same procedure in their examination was carried out as in previous years, the cultures being examined at the end of twenty-four hours, and, if negative then, again at the end of forty-eight hours. The staining method adopted was that of Neisser, chrysoidin modification.

As in previous years, the positive results have been again divided into positives after twenty-four hours' incubation, and positives after forty-eight hours' incubation. Though in most cases a culture of forty-eight hours' incubation has been examined twice, in some instances, as, for example, in swabs arriving at the week-end, the cultures have only been examined once, viz., at the end of forty-eight hours' incubation. Therefore the positive results under the forty-eight hour division are again divided into those positive after one examination, and those only positive after a second examination. As 477 swabs were positive after only twenty-four hours' incubation, and 118 were negative after twenty-four hours' incubation, but positive after forty-eight hours' incubation, the value attached to the re-examination of negative swabbings after further incubation is again illustrated, as it has been in previous reports.

During the year the disease was again, as in the previous year, rather endemic than epidemic, and, contrary to our experience previous to that period, there was an increased number of positive cases in the warmer months rather than in the colder months of the year.

In a list of cases examined on more than one occasion, five of these cases were under observation for from two to three months, one being examined on fifteen occasions over a period of 163 days, being positive thirteen times and negative twice.

Swabbings from the Training-ship "Tingira."

We have given details in previous reports of swabbings submitted from boys of this training-ship. These have been taken either with the view of preventing the introduction, by new boys acting as "carriers," of diphtheria bacilli to the ship, or for the purpose of diagnosis in cases of suspicious sore throats. The routine has been adopted of taking, in each case, one swabbing from the throat and one from each nostril. During 1916, 41 throat swabs were found to be positive, 21 suspicious, and 462 negative. Of nasal swabbings, of which, as a rule, two were taken from each individual, 38 were positive, 73 suspicious and 622 negative. It is probable that most of the suspicious organisms were diphtheroid bacilli. In view, however, of the importance of preventing the introduction of diphtheria, any case in which organisms were found which, though by means typical, nevertheless might possibly be unusual forms of diphtheria bacilli, were regarded as suspicious and precautions taken.

In one case nine examinations were made from one individual, extending over a period of three months. Six of these examinations, including the ninth, revealed the presence of diphtheria bacilli, whilst three were negative. Full tests were made of the organism isolated from the last specimen submitted, with the result that morphologically typical diphtheria bacilli were found which gave the typical "sugar" reactions, but proved non-toxic to a guinea-pig.

TUBERCULOSIS.

Examination of Sputa for Tubercle Bacilli.

During the year, 1,394 specimens of sputa were received from general practitioners, &c., to be examined for tubercle bacilli. Of this number, six bottles were found to be in a leaking condition, thus constituting a dangerous menace of infection to the staff, and the contents were destroyed without examination. In addition, 884 sputa were received for the same purpose from the Rookwood State Hospital and Asylum.

As in previous years the percentage of positive results during the late winter and early spring months of the year are lower than at any other period of the year. Comparing a six-monthly period extending from May to October, inclusive, with a similar period from November to April, inclusive, the average percentage is 20·98 in the first instance and 25·5 in the second.

ROUTINE COMPLEMENT FIXATION REACTION FOR SYPHILIS.

In considering the 886 cases examined during 1916, we have not attempted to make a full analysis of the figures, and this for several reasons, but principally because the historical notes forwarded to us on the cases tested do not form a reliable source of information necessary for a scientific analysis of our results. In many cases we had no reply to our request for historical details, and in others the reply was so meagre as to be useless for the purpose.

No definite conclusions can therefore be drawn from these figures as to the value of the method adopted in the diagnosis of syphilis.

It is interesting to note that whereas amongst the whole series of tests approximately 25 per cent. show a full positive reaction, yet there are considerable variations in the percentage of positives found in the various classes of patients dealt with. It is doubtful, however, what these differences

really indicate, as quite a number of circumstances may affect the type of cases submitted. Thus, unless every inmate of an institution be tested it is manifestly impossible to draw definite conclusions as to the relative prevalence of syphilis. The type of institution and the type of patient will vary the results greatly.

As regards cases tested on more than one occasion, 94 were tested twice or more, and of these 75 were tested twice, 10 were tested three times, 6 were tested four times, 3 were tested five times.

Dengue Fever in Australia.

Its History and Clinical Course, its Experimental Transmission by *Stegomyia fasciata*, and the Results of Inoculation and other Experiments.

(By J. Burton Cleland and Burton Bradley, assisted in the Inoculation Experiments by W. McDonald, M.B., Ch.M., Rookwood State Hospital and Asylum, Sydney.)

Scheme of Presentation of the Results.

Owing to the large amount of data which we have accumulated in carrying out our investigations into the nature of dengue fever as met with in Australia, and the necessity for presenting these data in full so that they, and our conclusions, may be subjected to detailed criticism, it has been necessary to adopt a rather unusual scheme of presentation in submitting our results and conclusions.

Introduction.

Epidemic dengue first reached Australia early in 1885. In the same year, according to Castellani and Chalmers in their "Manual of Tropical Medicine," it reached the Fiji Islands, "to which it was conveyed by a European suffering from the complaint." As later on in the same year a record occurs of cases of dengue fever on a steamer which arrived in Sydney from Fiji and Noumea, it is possible that the disease reached Australia from Fiji. Since this date, from time to time very extensive epidemics of dengue have occurred in Queensland, sometimes extending to the northern coastal towns of New South Wales.

A careful comparison of previous *clinical* descriptions of the epidemic disease known as dengue in Australia, with the description of the disease compiled from various sources as given in Castellani and Chalmers's "Manual of Tropical Medicine," does not reveal anything tangible to suggest that more than one disease has, up to the present, been comprised under the term "dengue fever." The only important clinical difference appears to be that in the Australian disease, though the pulse varies more or less with the temperature, it is nevertheless relatively slow, and sometimes absolutely so. Further, the dengue fever met with in Australia is undoubtedly not indigenous, and as a disease of this nature, which is confined to human beings, cannot arise *de novo*, the dengue fever of Australia must have had its origin outside Australia, and must be a disease which has affected from time immemorial the inhabitants of some other part of the world. Such a striking disease cannot have escaped observation and accurate record. It is quite obvious that it is included under the term "dengue," as this is used, for instance, by Castellani and Chalmers.

Origin of these Experiments.

In March, 1916, an extensive epidemic of dengue, then prevalent in Queensland, reached some of the north coast towns of New South Wales. The incidence on the population was exceedingly heavy, and business was greatly disorganized in consequence. As the experiments into its means of spread in Australia hitherto carried out had been few and inconclusive, it was considered advisable to visit the area affected and collect material there for further study of the disease. It was recognized that if infective material could be conveyed to Sydney, a town in which indigenous cases of the disease have never been known to arise, results might be obtained which would be free from fallacies attendant on experiments conducted in the epidemic area. At the beginning of April one of us therefore, with an assistant, paid a visit to Murwillumbah. He found that though the chief incidence of the disease had passed, there were still numerous cases, and that two species of mosquitoes were very abundant in the town, namely, *Culex fatigans* and *Stegomyia fasciata*. He collected a number of both species of these mosquitoes, more especially from houses in which cases of dengue had occurred and preferably in the actual rooms of patients then ill with the disease. In addition he withdraw specimens of blood, some of them being allowed to clot and some being received in citrated normal saline solution, from patients suffering from the disease. The materials thus obtained were brought back to Sydney.

The failure to transmit the disease by the first batch of mosquitoes brought down from the epidemic area led to another of us with an assistant visiting in May the adjacent town of Mullumbimby, then suffering heavily from the epidemic. A further considerable number of *Culex fatigans* and *Stegomyia fasciata* were brought back to Sydney, and the typical disease was conveyed by the bites of the batch of *S. fasciata* to four volunteers in Sydney, thus establishing conclusively the rôle that this mosquito can play in the spread of the disease.

I. The History of Dengue Fever in Australia, with a short Summary of the Clinical Descriptions of Previous Epidemics.[1]

II. Clinical Description of the 1916 *Epidemic of Dengue Fever on the North Coast of New South Wales.*

The facts utilized in compiling this description were mostly obtained by observations and notes on

[1] This has been fully dealt with by one of us (J. B. C.) in the Third Report of the Government Bureau of Microbiology dealing with the work performed during the year 1912, and published during 1914 by the Government printer, Sydney. Those interested are referred to that report.

cases seen by us on visits to the infected district, and by some observations on imported, mostly military, cases in Sydney. Thus our description is one largely of the symptomatology of the illness compiled from histories given us by patients, who, at the time, were suffering or had recently suffered from the disease. In particular we have little exact information as to the type of temperature or the pulse charts in the naturally occurring cases, and our descriptions of these are for the most part based on observations on our experimental mosquito-borne cases, or on what we have been told was the case by observers in the infected district. We have availed ourselves also of the excellent description by Goldsmid and Crosse,[2] to which we refer the reader.

Definition.—Dengue fever is an infective, non-contagious disease caused by an unknown organism which may be transmitted by the bite of *Stegomyia fasciata*. It is characterized by one or more febrile paroxysms more or less severe, head and body pains, and usually by polymorphous skin eruptions.

Incubation Period.—This is approximately one week (five to nine days). During this time the patient may feel perfectly well or may experience towards the end of the period some vague pains, malaise, headache or sleeplessness.

Onset.—This, in the large majority of cases, is described as sudden. Frequently the patient will give the exact hour at which he was taken ill, and may narrate how before a certain time he was quite well, and that after an extremely short period, perhaps half an hour from the first symptom, he was prostrate with the disease. Out of thirty cases replying to questions as to the nature of the onset, twenty-five replied that it was sudden, three that it was gradual. In two cases the replies were doubtful.

The onset is usually accompanied by fever, headache, malaise and slight shivering, and to a greater or less extent by pains and aches, which are very characteristic in the typical cases. In certain cases the relationship between the fever and other symptoms is less definite and the fever may precede or post-date the other symptoms.

Course.—After the onset the disease runs a course lasting from a few days to a fortnight or more (four to seven days—Goldsmid and Crosse). There may be two periods of intensity of fever and symptoms, separated by a period, varying in length but usually only of a day or so, of comparative abeyance of fever and symptoms, during which the patient may regard himself as well. This double phase is, however, in our experience, by no means a constant phenomenon, and its absence cannot be regarded as militating against the diagnosis of dengue. Moreover, especially in mild cases, although a four-hour temperature chart may show a distinct double-phase variation, the symptoms and temperature do not always vary *pari passu*. In some cases there appears to be a tendency to relapse at a later period, but we have no very precise information on that point. In a typical case, after a sudden onset accompanied by a rapid rise of temperature, shivering and headache, and occasionally slight vomiting, the patient takes to bed with pains in the back and limbs and severe headache. He passes a very restless night and may be delirious. He finds it almost impossible to rest in any position. For the following day or so the headache and body pains are worse. The temperature soon falls, and this may be accompanied by sweating, and the patient gets up, not feeling very well, and with a dirty tongue and a residue of pains. One, two or three days later the temperature goes up again and the symptoms return. The second attack lasts for one or two days, and then convalescence ensues. In the stage of onset there is usually an erythematous blushing of the skin and later on, from the second to the seventh day, a more distinct rash frequently appears.

It will be best now to review *seriatim* the outstanding symptoms and signs of the disease as met with in the North Coast.

The Temperature and Pulse.—We do not wish to discuss these fully at the present time, as our investigations have not enabled us to take first-hand records of many natural cases. From the information we can gather, however, the double-phase temperature is not constant, but inasmuch as few of the cases are in hospital where accurate records can be obtained, we cannot dogmatize on this point.

Goldsmid and Crosse say: "The temperature rose sharply and reached 101-103 deg. F. During the course of the illness it remained high and did not undergo marked fluctuation. Not infrequently it reached 105 deg. F. just before the termination of the fever. The fall was as rapid as the rise."

The pulse rate in natural cases has not come under our personal observation to any extent, but Goldsmid and Crosse confirm the results we obtained in our injection experiments. They say: "It (the pulse) was invariably slow in proportion to the temperature. A pulse rate of 75 to 90 was frequently associated with a temperature of 102 deg. or 103 deg. A more rapid pulse rate than 90 was rarely noted save just before the final fall of temperature."

The pulse rate and its relation to the temperature in experimental cases is discussed fully in a separate section.

The Facies.—The face soon assumes a very characteristic appearance, and in our experience this is one of the most useful signs of the disease. It looks red, swollen, hot and puffy. The eyes are usually somewhat injected, but there is neither excessive lacrymation nor any running at the nose. *Coryzal signs are notably absent*, although it must not be forgotten that an ordinary "cold in the head" may coincide with an attack of dengue. Out of twenty-six cases questioned as to the occurrence of "running at the nose" only one described it as being present.

[2] Goldsmid and Crosse, "Some Notes on Dengue." *Med. Journ. of Australia*, May 6, 1916, p. 377.

The facies of dengue has been described as resembling that of a person recovering from an alcoholic bout. It is also somewhat suggestive of the face in the early stage of measles but without the coryzal condition. The typical facies is most marked shortly after the onset, or, when this occurs, in the recrudescent period.

Headache.—Headache is a practically constant phenomenon. Thus, out of twenty-six cases questioned all gave a history of headache. In some cases it was located as frontal; in others as vertical or occipital; and quite frequently as "all over the head." Frontal headache is hard to distinguish from the characteristic eye pains, and the sufferer frequently refers to pains "at the back of the eyes." The intensity of the headache varies very much. In certain cases it appeared to be the principal cause of complaint, sometimes being described as "agonizing," whilst in others it was referred to as slight.

Eye Pains.—The painful eyes are, in our opinion, quite one of the most characteristic single signs of dengue, and are almost always present in some degree. Sometimes the eyes are said to be aching severely and painful on movement, and we have seen cases where the whole head was turned rather than move the extremely sensitive eyes. In others, it is only by careful questioning that the presence of some pain or tenderness in the eyeballs or eye-muscles is elicited.

Out of twenty-eight cases questioned, twenty-five described pains in the eyes and three denied their existence. Out of thirteen cases questioned on the point, eleven said the eyes were painful to move, and two replied negatively.

Apparently the earlier symptom is pain in the eyes or in the "back of the eyes," easily confused with frontal headache. Later there is definite pain and tenderness apparently in the eyeballs, which is associated with pain on ocular movement and probably often with some photophobia.

Occasionally the eyes are described as "sore," which word may be used to refer to the irritation of slight conjunctival congestion, but conjunctival symptoms are never prominent and the adjective "sore" is probably frequently used to refer to the deeper-seated pains in the eyeballs.

General or Body Pains.—These vary very much in degree and are by some described as intense and agonizing, and they may require the administration of morphine; in other cases they are described as "tired feelings," "gone in the knees," and "influenzal pains." In our experience the "break-bone" type of case is the exception, and the pains are, as a rule, not a very prominent feature. Sometimes their occurrence is denied in a particular case or only elicited after careful questioning. Restlessness and inability to stop in one position is characteristic of some cases, and is probably closely linked to the body-pain symptoms. Out of thirty-two persons questioned, all described various degrees of *body pains* somewhere *in the spinal axis*, and out of twenty-six questioned, all described pains in the limbs. The back of the neck is a common seat of fairly severe pain (sixteen out of eighteen questioned). *Lumbo-sacral pain* is also common—"across the back"—fourteen out of fourteen questioned. Real *pains in the joints* appear to be uncommon apart from the general limb ache. Movement does not seem to definitely increase the pains, but when severe, the patient generally takes to bed because of the pain and associated symptoms. The body pains of dengue are, in our opinion, not associated with any readily demonstrable lesion. No swelling, redness or tenderness, were noted in any case. This is in striking distinction to the description by Osler, who refers to red, swollen and painful joints.

Abdominal Pains.—These were described by ten out of a series of sixteen cases questioned, and are sometimes associated with diarrhœa. At other times they are apparently a "spreading round" from the lumbar and dorsal region of the back pain. Pain in the epigastric region, associated with vomiting, is spoken of by Goldsmid and Crosse as occurring in several cases.

The body pains gradually subside, but there is usually a recrudescence of the pains when the second phase occurs. After the febrile stage is over there is generally some tiredness or aching for several weeks in the spine or limbs, which, however, gradually passes off.

Other nervous symptoms occurring in the disease are giddiness, delirium, mental irritability, depression and sleeplessness.

Giddiness is a common feature at various times in the course of the disease (nineteen out of twenty-two questioned).

Delirium is not frequent, but we have seen cases where there was maniacal delirium for three nights after the onset, and many cases show some mental wandering when the temperature is high. Delirium was mentioned as a symptom in six out of twenty-one cases questioned on the point.

Mental Irritability is a striking feaure of the disease, especially in the later stages.

Depression.—The depression following the attack is one of the most marked features, and the patient may be actually incapable of concentration or serious mental effort for a week or so after the attack.

Sleeplessness is found at some time in nearly all cases.

Gastro-intestinal symptoms are not marked. There is, however, a *dirty tongue*, which is rather characteristic, being furred at the back with a strawberry tip very like that seen in scarlet fever. The *fauces* are reddened—Goldsmid and Crosse note a fine stippling of the soft palate as an early characteristic sign—and there may be some sore throat. This is usually not marked. *Anorexia* is a feature in most cases (thirty out of thirty questioned). *Nausea* is fairly common (eighteen out of twenty-nine questioned), and *vomiting*, though not as a rule marked, is met with especially at the onset (thirteen out of twenty-nine questioned) and occasionally may be severe. Some cases suffer no disturbance of the bowels, but *diarrhœa* is present in a few cases (two out of twenty-nine). *Constipation* is not general (four out of eleven).

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Shivering occurs commonly (twenty out of twenty-four cases questioned). It may occur with the onset and during the febrile stage, but rigors are the exception.

The Skin Eruptions.—According to Goldsmid and Crosse the preliminary and terminal rashes were well marked in cases seen by them. They note, however, that the preliminary rash could easily be overlooked. They describe this as a "fine punctiform rash usually found over points of friction. . . . It appeared and disappeared very suddenly. . . . A fine stippling of the soft palate was often the only rash present when the patients were first seen." They describe the terminal rash as "polymorphous," and as being present in nearly every case. "It was either papular or a dark red, blotchy rash, or an urticaria."

Our own experience probably covers a somewhat different type of case to that seen by Goldsmid and Crosse, as a great number of dengue sufferers seen by us had not consulted any medical man at all, and these were generally the mild cases which may show an absence of certain symptoms or signs. Thus, while we agree in the main with them, we would modify their description in certain particulars. We do not think a rash is often entirely absent, but it is often so transitory or slightly marked that unless the patient is under medical examination, and even then at times, it is easily overlooked. This applies not only to the preliminary but to the later rash. Our experimental cases bear this out. It will be seen that in several cases we were unable to make up our minds at all as to whether a rash was or was not present.

The distinction also between the prodromal and later rash is, in our opinion, not very valuable. Although in some cases it is possible to note definite skin eruptions at two periods separated by a period in which the rash is absent or not marked, there are such great variations in the degree and type of the skin conditions of dengue that the distinction into two rashes is not of great value.

Early in the disease it is unusual to find a definite eruption though we have seen cases with well-marked measly rashes within forty-eight hours of the onset. A hypersensitiveness of the skin which tends to the production of blotchy erythema on points of pressure is an early sign, and *tâche cérébrale* is well marked in most cases. The red congested condition of the face has been referred to before. In the early stages it is quite frequent for two observers to differ as to the presence of a rash. The more definite skin eruption is generally found later. Though it may be found well marked from the second day, it may not be noticed till the fifth or seventh day. It presents somewhat variable characteristics and lasts from a day or so to (rarely) several weeks, and is usually followed by slight desquamation and sometimes by intense itching.

We have not sufficient data to describe accurately the distribution of the rash, but we have found it affecting almost any part of the trunk and limbs. It seems as a rule to be less marked on the face, which merely shows congestion. On the back, especially in the lumbar region, it is frequently very distinct, and extends round on to the abdomen, where it is often less marked. The legs and arms are frequently affected, as a rule the arms showing more definite lesions. The hands are liable to be affected, and bright pink spots, followed by intense itching and desquamation, are sometimes found on the palms.

The characteristic of the rash has been described by someone as its "want of characteristic." We think a good definition for the rash in many cases is "mid-way between those of measles and scarlet fever, but less definite." It is, as a rule, some form of a blotchy erythema, though especially in later stages the eruption does not completely fade on pressure. The size and shape and intensity of the blotchings, to a great extent, account for the differences in appearance. In most of the cases seen by us patches of red skin alternate with pale (normal) patches in a most irregular mottling. The red patches show no definite point of maximum intensity but at times the hair follicles are red and prominent, giving a strawberry appearance to the red blotches. The red areas do not show definite lines of demarcation from the adjacent normal skin. The blotchings vary in size, but are usually not more than a $\frac{1}{4}$ to $\frac{1}{2}$ an inch square. On the legs of one patient, however, there were large irregular patches much larger than this and of a very bright pink. At the same time this case had a dull measly mottling on the trunk.

In some cases we have seen a very characteristic reddening and swelling of the elbows of a peculiar tint suggestive of a stain of eosin that has been partly washed out. This may be surrounded by a papular condition in the vicinity. Papular rashes have been rarely noted by us, but sometimes are seen on the feet or lower legs.

We have seen no urticarial cases, but these are described by Goldsmid and Crosse and others, and some cases have told us they had this condition. They present another variation of the skin lesion.

Two other skin conditions should be noted here. In the North Coast district we have seen several cases of a papulo-pustular condition around the ankles and extending up the leg for perhaps 12 inches. This was described to us by several patients as a sequel of dengue, but we are not sure whether this was not due to infected mosquito bites or to infection conveyed by scratching the irritable desquamating skin. *Jaundice* is said to occur in some cases and we have seen it in a few ourselves, but it has never been more than slight. It is of interest, however, in connection with the suggested relationship of dengue with yellow fever.

Diagnosis.—From "*influenza*" the diagnosis rests chiefly upon the absence of coryzal symptoms, usually present with the so-called "influenza" seen in this country. As we have previously mentioned, the absence of coryza is a noticeable feature in dengue. Twenty-six persons were specifically questioned on this point, and all but one denied having

any "cold in the head," "running at the nose," &c. Cough, again, which may be a feature of certain influenzal attacks, is usually absent. It was described in only seven out of twenty-four cases questioned. When present it is seldom more than a slight irritative cough, probably associated with the naso-pharyngeal congestion which is often present. The rash, and double-phase temperature, and eye-pains on movement, are important points when present.

From *scarlet fever* and *measles* dengue may be difficult to differentiate in isolated cases, and typical cases with a rash occurring early in an epidemic are often diagnosed as measles or scarlet fever. The coryza, nature and distribution of the rash, and Koplik's spots should generally, however, make a diagnosis of measles possible. The pulse in measles is rapid; in dengue often relatively slow. In scarlet fever the early vomiting, throat angina, type of rash, quick pulse, and leucocytosis are important points.

The diagnosis from *yellow fever* is not of much importance in this country at present, but should be kept in mind in view of the possibility of the introduction of yellow fever into the *Stegomyia*-infested part of Australia. Jaundice, though sometimes seen in dengue, is not frequent. Albuminuria is absent in dengue. The slow pulse of yellow fever, which is used as a differential sign by Guiteras, cannot be employed with the dengue of Australia. The mild nature of the disease is a practical point when dengue is epidemic, though we cannot exclude the possibility of mild cases of yellow fever appearing. In fact some observers have suggested that the dengue of Australia is really a modified yellow fever. The history of the disease and the known variability of dengue in various parts of the world, even in different parts of Australia, and the fixed mild character of the disease here, are arguments against this. It seems probable, however, that dengue fever is a closely related disease to yellow fever.

Acute rheumatic fever should be considered, but the localization of pains in the joints and the absence of rash are usually sufficient. Inasmuch as other observers have described painful hot swellings of the joints in some epidemics of dengue, it is possible that further investigation may disclose such cases in Australia. With one doubtful exception, we have never seen any joint affections. This case was a child in the early febrile stage of some infection, who had pains and some swelling in several joints, but we were not able to follow the case further and do not know the final outcome. One of us diagnosed the case as "acute rheumatism."

Australian Mosquitoes as Conveyors of Disease.

As both *Culex fatigans* and *Stegomyia fasciata* are common household pests in most parts of Australia, which have suffered from this recent epidemic of dengue, it seemed quite probable that, if a mosquito were a vector of this disease, it might be one or other or both of these two species. *Culex fatigans* is common in summer time in the southern districts of Australia where dengue does not occur, whilst the distribution of the disease is practically that of *Stegomyia fasciata*. Coupling these facts with the observations and experiments of Dr. Bancroft, greater suspicion naturally falls upon *Stegomyia fasciata* than upon *Culex fatigans*. In our experiments both of these species were used. *Stegomyia fasciata* was found to bite freely in captivity in the day time, but *Culex fatigans*, though it did bite at night time, was more shy and difficult to handle. In considering the transmission of the disease, a study of the habits of the mosquitoes in an infected area is important. Observations of the mosquitoes in general will show why it is that some species can readily transmit disease, whilst in the case of others disease transmission is unlikely. *Culex fatigans* and *Stegomyia fasciata* are essentially domestic mosquitoes, thereby possessing increased facilities for transmitting diseases to human beings over "wild" mosquitoes. It is highly probable that both are introductions to Australia, having been non-existent here before the arrival of the white population. Both can apparently be easily conveyed from place to place by means of human agencies.

In this place it may be well to review shortly a few of the Australian mosquitoes which may play a part in conveying disease, or are present in exceptional numbers.

Culex fatigans Wied.—This is the common domestic mosquito, and is probably almost universally distributed throughout Australia. One of us (J.B.C.) has met with it abundantly in Sydney and in many country towns in New South Wales, and also in Adelaide. In the warmer parts of Australia it may probably be found biting throughout the year, but in the southern parts it disappears throughout the cold months,, though during warmer evenings an occasional individual may be met with. It is essentially a night-biter and a feeder in the dark. We have never met with it biting during the daytime, but it occasionally bites in the evening in a poorly-lighted room. Under these circumstances it is more especially the legs or some other portion which is not exposed to the light that are bitten. The hum of the mosquito at night-time is very disturbing, the anticipation being more annoying than the bite itself, which in the cases of a number of individuals can hardly be noticed. Many of those bitten by the mosquito do not react by the raising of a wheal. At any time in bed the approach of the mosquito can usually be felt by the currents of air produced by the wings. This draws attention to the parts where the mosquito settles, and, as it begins to feed, in many cases a slight but indefinite pricking sensation indicates the exact site. However quickly the hand is raised without disturbing the bedclothes, it is only rarely the movement is sufficiently quick to enable the mosquito to be destroyed. Its breeding place is in various domestic water supplies—probably the cisterns of water-closets may prove to be one of the most important of these. In places such as Sydney where, during summer in some seasons, there may be long periods without any rainfall, and in other

seasons abundant rains for many days, the number of mosquitoes may be greatly increased under the latter conditions, indicating that breeding places form as a result of collections of rainwater. It has not yet been ascertained exactly where these outside breeding places are located in a city like Sydney, where, in the better residential localities, tins, broken bottles, and similar receptacles are not left lying about; but it is probable that places, such as depressions in gutter spoutings, are some of the most important sites.

The distribution of this mosquito extends far beyond the areas in which dengue fever has occurred. For instance, though the mosquito is abundant in the neighbourhood of Sydney, no indigenous cases of dengue are known to have arisen in this city. Considering that imported cases of dengue have been not uncommon, the inference might be drawn that if *Culex fatigans* were capable of transmitting this disease, endemic cases should in consequence have arisen in Sydney.

Stegomyia fasciata Fabr.—*Stegomyia fasciata* occurs in Queensland and extends into the northern coast towns of New South Wales. We have found it at Tweed Heads, Murwillumbah, Mullumbimby, Byron Bay, Casino, and Grafton. Dr. Ferguson has also identified specimens from Maclean and Tabulam.

Though the species has been recorded from Newcastle and from Victoria, there seems considerable doubt as to the identification, and in all probability specimens so designated were really *Scutomyia notoscripta*.

The insect is a day-biter, and during the recent dengue epidemic it was abundant in houses in the affected district, usually being more active in rooms that were dimly lighted. It was found breeding in water tanks, and in similar domestic supplies, one such source worthy of notice being open water in connection with acetylené gas installations. It is interesting to note that larvæ were drawn off from the bottom of a tank which was 4 to 5 feet high, and which, as heavy rain had been falling for some days, was presumably full of water. In two or three jugs of water drawn off from the bottom, some larvæ were obtained which afterwards hatched out. It is possible that these larvæ had sunk to the bottom for the purpose of moulting, as it is hard to believe that the insect in its active phase could descend to a depth of 4 to 5 feet in the water and rise again sufficiently quickly to maintain its activities with their necessary accompaniment of oxygen.

We were able to confirm the statement recently made that the eggs of *Stegomyia fasciata* can resist drying for some while and then develop under suitable conditions. In our second batch of these mosquitoes a number of eggs were laid in a small dish of water. On June 29 this dish had become perfectly dry and was left exposed on a laboratory bench until August 30, that is, during the end of winter and the beginning of spring. It was then immersed in water, and in a few days some of the eggs hatched. Owing to the weather being cold these developed very slowly, but early in November a recently hatched adult was found floating on the surface of the water. At this period it was also noticed that a number of further eggs had hatched, the weather having become warmer. It would therefore appear that not only can the eggs resist two months' absolute drying and then develop immediately on immersion in water, but that they may also remain for some period without developing in this water until the weather becomes warmer.

A review of the above distribution of *Stegomyia fasciata* will show that the recent epidemic of dengue was nearly co-extensive with it. Thus, the epidemic appeared in all of the towns mentioned with the exception of Maclean and Tabulam, about which we have no information. It is interesting further to note that the epidemic extended southwards along the railway line, and this is doubtless explained by travellers becoming infected in one town and developing the disease in another, and there infecting the local mosquitoes and starting a fresh centre of the infection. Probably railway communication also facilitates the dispersal of *Stegomyia fasciata*. Though we did not find *Stegomyia fasciata* in railway carriages at Murwillumbah during the epidemic, we found them in the station-master's office at Byron Bay. At Murwillumbah the mosquitoes found in the railway carriages were chiefly *Culex fatigans* and occasionally *Culicelsa ennulirostris*.

Scutomyia notoscripta Skuse.—This is a widely-distributed mosquito throughout Australia, though we have never met with it in abundance. It resembles very closely *Stegomyia fasciata* in its thoracic markings, but can be at once distinguished by a pure white band on the proboscis. It may occasionally be found biting inside houses. It is not known to be responsible for conveying any disease to human beings.

Culicelsa vigilax Skuse.—This is the common bush mosquito so numerous at certain periods of the year in the neighbourhood of Sydney and other similarly situated districts. In places it is exceedingly numerous, as, for instance, in some of the creeks running into the Hawkesbury River, where human beings may be attacked by hundreds of these insects at a time. The bite is fairly painful, and often raises small wheals. It is very interesting to compare the behaviour of this mosquito when attacking man with that of such domestic mosquitoes as *Culex fatigans* or *Stegomyia fasciata*. As already indicated, these two latter are exceedingly wary in their habits, so that it is a matter of skill to kill them when they are attempting to bite. With *Culicelsa vigilax*, however, the insects settle on the hand or face, and the finger can be slowly lowered down upon them, and can crush them without disturbing them. *Culicelsa vigilax* is an Australian species accustomed to live in our bush, and probably to feed chiefly upon birds and marsupials. Living on these hosts, which are unable to protect themselves against attacks of the mosquitoes by slapping them with hands, there has been no need for the mosquito to be very dexterous

in leaving the host on which it has settled. Restless movements on the part of the animal attacked would be the usual means of dislodging the pest. Consequently, natural selection would allow a type to develop which was comparatively slow in removing itself from danger. Since the domestic mosquitoes *Culex fatigans* and *Stegomyia fasciata* feed probably to a great extent on human beings, and to a less extent on birds, such as sparrows and swallows living in the neighbourhood of houses, and on domestic mammals, the perpetuation of the species has necessitated the development of exceedingly alert habits so as to escape from their most potent means of destruction—the hands of man.

Culicelsa annulirostris Skuse.—Though a widely-distributed mosquito in Australia, and present in the area affected by the recent epidemic of dengue, there seems no reason at present to consider that it is responsible for the conveyance of any disease in man.

Nyssorhynchus annulipes Walker.—This mosquito, the chief malarial transmitter in Australia, appears to be widely distributed throughout the continent, but in the southern parts, as a rule, only in small numbers. Here and there areas exist where it is present in sufficient numbers to be a source of danger should imported malarial cases reside there. In the coastal parts of Queensland, however, and in the Northern Territory, its incidence is sufficiently great to maintain in places endemic foci of malaria.

As regards the diseases spread, or possibly spread, by mosquitoes in Australia, malaria has already been mentioned. Our experiments on the conveyance of dengue have clearly proved that *Stegomyia fasciata* is responsible—is perhaps alone responsible—for the spread of this disease in Australia. The same mosquito, as is well known, is the transmitting agent of yellow fever. *Culex fatigans*, the common domestic mosquito, is a transmitting agent of *Filaria bancrofti*, and is apparently responsible for the distribution of this disease in Queensland. So far there are no other diseases of human beings in Australia which are known to be transmitted by mosquitoes.

Summary of Experiments.

The following is a short summary of the experiments made and the results obtained with the mosquitoes, taking the nine persons volunteering *seriatim*:—

Case 1.—J. G., male, laboratory assistant (18 years), the subject of an unsuccessful *Stegomyia* biting experiment of the first series, was bitten on May 11, 1916, at 2.15 p.m., by some twenty-eight *Stegomyia* mosquitoes. He remained well until the afternoon of May 19, 1916, eight days later, when he noticed he had headache. That evening at 7 o'clock (eight days and five hours), he was again bitten by *Stegomyia*, and, while sitting with his hand in the cage, first became definitely ill. He passed through a typical attack of dengue fever, showing a double temperature curve, rash, and symptoms described in detail below. Blood from this case reproduced the disease on injection. *Result positive.*

Case 2.—McD., male, laboratory assistant, not previously the subject of experiment, was bitten on May 12, 1916, by ten *Stegomyia*, and on May 18, 1916, by three or four *Stegomyia*. He remained well until June 3, 1916, seventeen days from the second biting and twenty-two days from the first biting, when he had an influenzal attack with coryza for a few days, with no rash and nothing suggestive of dengue. *Result negative.*

Case 3.—G., male, laboratory assistant, not previously the subject of experiment, bitten by about nine *Stegomyia* on May 13, 1916, and by about three *Stegomyia* on May 17, 1916. No symptoms have followed these bitings to date—July 14, 1916. *Result negative.*

Case 4.—Wm., male, laboratory assistant, not previously the subject of experiment, was bitten by about thirty-six *Stegomyia* on May 14, 1916 (midday), and by about thirty-six *Stegomyia* on May 15, 1916 (12.30 p.m. and 4.30 p.m.). On May 20, 1916 (six days and nine hours from first biting), whilst going to bed at night, he became ill and had a typical attack of dengue, with double temperature, rash and other symptoms detailed in Appendix III. His blood on injection reproduced the disease. *Result positive.*

Case 5.—M., female, a nurse, was bitten by eighteen *Stegomyia* on May 16, 1916 (noon), and became ill on May 25, 1916, 10 p.m. (nine days and ten hours later), and passed through a rather severe type of dengue, with marked rash and double temperature. No blood was taken from this case for injection experiments. *Result positive.*

Case 6.—B. B., medical practitioner, was in dengue fever districts—Mullumbimby, Casino and Grafton—leaving Grafton for Sydney by boat on May 13, 1916. To keep the mixed Grafton mosquitoes alive, he allowed them to bite him on May 12, 1916, and May 14, 1916, but remained perfectly well till, on May 23, 1916 (2 p.m.), ten days after leaving the dengue district he was bitten by fifteen *Stegomyia*. He remained quite well till May 29, 1916, and the temperature normal till May 31, 1916, on rising, 9 a.m., seven days and nineteen hours, when he became definitely ill and passed through a severe attack of dengue, with definite prodromal and secondary rashes, double temperature, and marked pains, &c., as described in Appendix III. Blood from this case reproduced the disease on injection. *Result positive*, but open to criticism as having been in a dengue district eighteen days before the attack developed.

Case 7.—W. T., bitten by one *Stegomyia* on May 12, 1916. No illness followed. *Result negative.*

Case 8.—M., a patient at a hospital, was bitten on May 11, 1916, by about twelve *Culex fatigans*, and on May 12, 1916, and May 13, 1916, by an unknown number of *Culex fatigans*, and on May 14, 1916, by at least twenty *Culex fatigans*. *Result negative.*

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Case 9.—J. O. S., laboratory assistant, a subject of *Culex* experiment in the first series, was bitten on May 15, 1916, by two *Culex fatigans*, and on May 18, 1916, by — *Culex fatigans*. No symptoms followed. *Result negative.*

General Conclusions.

Stegomyia fasciata mosquitoes caught in a dengue infected district in the surroundings of cases of the disease, and some of them known to have fed on a dengue patient on the first and second days of his illness, transported to a non-dengue district, reproduced the disease in four out of seven persons on whom biting experiments were conducted.

Blood taken from three of these four cases reproduced the disease when injected into further persons. The blood of one case was not tested.

The incubation period of the four cases was found to be possibly between five and nine and a half days, probably between six and a half and nine and a half days, counting from the biting to the definite onset.

No known case of contagion occurred from any of the above four cases.

No evidence was obtained from two cases, one of which was heavily and repeatedly bitten with *Culex fatigans*, that *Culex fatigans* is capable of acting as a transmitter of dengue fever.

A Contribution to the Experimental Pathology of Acute Poliomyelitis (Infantile Paralysis).

A. W. Campbell, M.D., Ch.M.; J. Burton Cleland, M.D., Ch.M.; and Burton Bradley, M.D., D.P.H.

Introduction.

The leading features of this communication are, firstly, the positive diagnosis by laboratory methods of a previously doubtful case of Acute Poliomyelitis (Infantile Paralysis); secondly, an example of the successful transmission of the human disease to a monkey by intraperitoneal injection of unfiltered spinal emulsion; thirdly, an example of a failure similarly to transmit the disease when the emulsion was filtered; fourthly, an experimental failure to transmit the disease by means of the *Stomoxys calcitrans;* and lastly, illustrations of the histopathology of the human disease in an early stage, and of the experimental disease as it appeared in a monkey.

It cannot be claimed that the communication brings to light any unknown facts concerning acute poliomyelitis, but we feel that its publication is justified in the first place, because opportunities seldom arise for the pathological examination of the nervous system in acute stages of this disease; and secondly, the experimental researches of Flexner and his collaborators at the Rockefeller Institute, of Levaditi at the Pasteur Institute, and of several others on the Continent, are so recent as to be of acute interest, and so important and so technically delicate as to call for repetition by others.

Report of a Case of Human Poliomyelitis.

On April 6, 1916, by direction of the Coroner of Sydney, Dr. A. A. Palmer conducted a post-mortem examination of a boy, R.G.R., aged 6 years, who had died after two days' illness with obscure symptoms. He had had a high temperature, headache, and furred tongue.

The body was thin, and the teeth irregular and notched. There was a good deal of frothy mucus in the air passages; the lungs were œdematous, and their lower lobes deeply congested. There were some yellow patches on the mitral and aortic valves. The liver was congested and firm; the spleen enlarged and firm; the right kidney was absent, and the left kidney enlarged and congested. (Albumin was present in the urine.) The mucous membrane of the duodenum was intensely congested and the mesenteric glands were enlarged; the thymus also was enlarged. The brain was congested.

The fact that at the time this examination was made a moderately extensive epidemic of infantile paralysis was on its wane, together with the obscure symptoms of the case and the rapid death, directed special attention to the possibility of the case being one of acute poliomyelitis. The cord was consequently removed and on naked-eye examination the unusual pink appearance strengthened suspicion.

The spinal cord and various organs were then submitted to the Microbiological Laboratory for detailed examination with the following results:—

The *heart* showed patches of atheroma in the inter-ventricular septum and in the aorta. Microscopical examination of a section of the wall near the apex showed no special changes. The *liver* showed nothing notable macroscopically or microscopically. A portion of *lung* submitted was red and œdematous; nothing special was noted microscopically. The *spleen* was enlarged to about 3½ in. by 2¾ in., was red and congested, and showed marked prominence of the Malpighian bodies; no special changes were noticed microscopically. The right *kidney* was absent; the left was large. The only change seen microscopically was congestion of the capillaries. The *mesenteric glands* were enlarged and firm, and showed no special microscopical changes. The *thymus* was about 2 in. long by about 1½ in. broad, but showed no special microscopic changes. In the *spinal cord* the meninges were very pink, whilst the grey matter was deeply coloured, and very clearly marked. Portions of the spinal cord were cut from four different levels for microscopical examination, the details of which will be given later, whilst the rest was ground up with 50 c.c. of 1 in 3 glycerine and normal saline solution.

Monkey inoculated with an Emulsion of Human Spinal Cord from a Case of Acute Poliomyelitis.

A large monkey, *Macacus cynomolgus*, was in-

oculated intraperitoneally on May 24, 1913, with about 5 c.c. of the above-mentioned emulsion.

May 30.—To this date the animal continued active and healthy, and took its food well.

May 31.—At 9 a.m. the monkey was noticed to be very quiet. He was undisturbed. At 11.30 a.m. he was found to be markedly paretic in both hind limbs. On moving he flopped from one to the other side of the loins. He was able to draw himself up to the bars of the cage by the hands and legs. In the afternoon he was found lying on one side.

June 1.—He was lying on his side. He could not raise himself higher than his arms; he was quite paretic in the hind limbs, but the tip of the tail occasionally moved. The rectal temperature was 37·75 deg. C.

June 2.—His condition was worse. The hind limbs were now quite paralytic. There was slight movement in the tip of the tail. The arms had become flaccid, but he was able to move them slightly and partly raise himself. He could move the head normally and yawn. The rectal temperature at 4.30 p.m. was 34 deg. C.

June 3.—Still lying down. He could just move slightly the arms, which were now very paretic. The eyebrows and face were alert and movable. The temperature was 35 deg. C.

June 4.—The hind limbs fell heavily when lifted. The tail showed slight movements of the tip when moved by someone, but these were apparently purposeless. He could not move the forearms himself, but when these were lifted up they did not fall so heavily as the hind limbs. Movements of the head were apparently normal, and food was eaten when placed in the mouth. He gave no indication of pain when a number of *Stomoxys calcitrans* confined in a tube were allowed to bite his side, but continued eating his food while being thus bitten. From being a monkey dangerous to handle he now gave a chuckle of pleasure when patted. He seemed to-day a trifle better. The temperature was 34·8 deg. C.

June 5.—He was much the same. The temperature was 34 deg. C.

June 6.—Perhaps a slight improvement in the fore-limbs. The temperature was 34 deg. C.

June 7.—The hind limbs were completely flaccid, falling heavily on lifting. The fore-limbs were paretic, but showed some tonicity when they were let go, falling less heavily than the hind limbs. They also showed occasional slight movements. Movements of the face and neck were normal, and he ate well when food was placed in his mouth. When food was placed in his hand he tried to move his head towards it, but could not move the hand towards the mouth. Dr. George Rennie kindly examined him on this occasion. Knee-jerks were absent, but an ankle jerk was present. There was a slight periosteal reflex in the fore-limbs. There was no elbow jerk. He was apparently entirely insensitive to pain (pin pricks) up to a transverse line behind the fore-limbs. In front of this, and in the fore-limbs, slight pain was evidenced by the physical expression. This evidence of pain became more definite as the head was approached. He had been passing a little blood in the urine during the last few days.

June 8.—The arms could perhaps be moved a little more freely. The temperature was 34 deg. C. At 3 p.m. he was killed.

Post-mortem Examination.—The spleen, liver, heart, and lungs were found normal; the kidneys were slightly congested; the salivary glands were apparently normal. There were no enlarged Peyer's patches in the intestines; the bladder was normal. The brain appeared slightly congested. There was perhaps a slight excess of clear cerebro-spinal fluid in the spinal cord. The upper part of the spinal cord appeared normal, but from the mid-dorsal area downwards seemed softer than usual. In the lumbar enlargement this softening was definite and the grey matter appeared deeply congested. Sections of the liver showed microscopically nothing special. The kidneys showed congestion of the capillaries, whilst the mesenteric glands showed the presence of some blood pigment in the walls of the medulla. The details of the microscopic examination of the spinal cord are given later.

Monkey inoculated with the same Emulsion as Monkey No. 1, but after Filtration through a Pasteur-Chamberland Filter.

This small *Macacus* was inoculated at the same time as the large animal on May 24, 1916, with the same material after it had passed through a Pasteur-Chamberland filter F. It never manifested any evidence of illness or paresis.

The Monkey on whom Stomoxys Calcitrans were fed after feeding on the Monkey inoculated with the Virus of Acute Poliomyelitis.

The monkey used in this experiment had a "withered" left arm which was flexed at the elbow and the wrist. He was kept in a separate room in a quite different part of the building to the inoculated monkey.

On June 1, 1916, about 300 *Stomoxys calcitrans* caught in the neighbourhood of the abattoirs, near Sydney, were allowed to bite the inoculated monkey. This was the day after the first development of its illness. At noon on June 2 the *Stomoxys calcitrans* which fed on the inoculated Monkey No. 1 on June 1 were allowed to bite the *Stomoxys* Monkey No. 3. About a dozen had died, but the rest fed freely, probably most of them biting. In the afternoon about fifty more *Stomoxys* which had been starved for two days were fed on Monkey No. 1, and then within fifteen minutes on Monkey No. 3.

June 3.—The *Stomoxys*, of which 110 were counted, were fed first on Monkey No. 1 and then on Monkey No. 3. They fed freely on both.

June 4.—The *Stomoxys* still alive, about ninety in number, were fed for five minutes on Monkey No. 1, and then for ten minutes on Monkey No. 3. The latter monkey was evidently bitten severely, as it screamed several times.

June 5.—About 70 flies were fed on each of the monkeys.

June 6.—The flies were again fed on both the monkeys.

June 7.—The flies again fed on both monkeys.

June 8.—The flies still alive, about seventy in number, were fed on both monkeys. The inoculated monkey was killed on this date.

June 9 and 10.—About sixty flies fed on the monkey.

June 12.—Fifty-six flies fed. His temperature, which from June 5 to 10 had been consistently 36°, was now 37·5°

June 13.—Thirty-five flies fed. Temperature, 38°.

June 14.—Thirty-two flies fed. Temperature, 37°.

June 15.—Twenty-eight flies fed. Temperature, 38°.

June 16.—Eighteen flies fed. Temperature, 38°.

June 17.—Four flies fed. Temperature just over 38°.

June 19.—Two flies fed. Temperature, 37°.

June 20.—All the flies were dead.

Throughout this period and thereafter the animal showed no evidence of illness or paresis whatsoever.

The question may be raised as to whether the withered arm of this monkey might have been due to a naturally contracted attack of acute poliomyelitis. The fact, however, that the arm was rigidly flexed and not flaccid would seem to exclude this.

Remarks.

A case is here shown in which the cause of death was doubtful until microscopic examination of the spinal cord, and an experiment on an animal, definitely proved it to be acute poliomyelitis.

Experimentally the human disease was reproduced in a Macaque monkey by intraperitoneal injections of unfiltered glycerinated spinal cord emulsion, but there was failure to transmit the disease when the emulsion was filtered and similarly used.

Concerning the successful experiment it was but a repetition of what has been found by many others; while the failure to transmit the disease with filtered emulsion, puzzling to us at first, is now readily to be explained. We have since learned, first from the experiments of Flexner and his school, that although infection has been produced by injection of the virus, filtered or unfiltered, into the peritoneum (also into the anterior chamber of the eye, the subcutaneous tissues, the spinal canal, veins and the sheath of nerves) the most certain method of producing infection is by injecting the virus into the brain. The reason for this is that within the nervous tissues the disease finds the most favourable conditions for operation. Secondly, although we knew from the experiments of Landsteiner and Levaditi, and others, that the virus would pass through porcelain filters and withstand glycerinization, we were not aware that after such treatment, especially filtration, the virus lost strength, and thereby the incubation period of the disease was prolonged, or only a mild form of the disease was produced. From the foregoing it is easy to understand our failure with the filtered emulsion.

Concerning our attempt to infect by using *Stomoxys calcitrans* (the stable fly) as a carrier we would indicate that the experiment was cautiously conducted and thorough, inasmuch as steps to prevent contagion were taken by keeping the infected animal and the test animal widely apart in cages in different parts of the building, and by employing numerous flies and giving them abundant opportunities of feeding on both animals. The negative result is in accordance with recent experiments carried out at the Rockefeller Institute, and in accordance, moreover, with the belief that the infection in poliomyelitis is local and neural and by way of the lymphatics, not general by way of the blood-stream. On this point we may mention that experiment has shown it to be difficult to infect a monkey with the blood of a patient suffering from acute poliomyelitis, a large quantity of blood being required. How much more difficult must it be for the *Stomoxys* to carry over a sufficiency of the virus. We would subscribe, therefore, to the belief that epidemic poliomyelitis is not spread by means of the stable fly.

Lastly, concerning the histological findings in both this human and this experimental case, although they depart in no important respect from what has been described by others as characteristic of the disease in an acute stage, they have confirmatory value in showing that distended blood-vessels, perivascular hæmorrhages and perivascular lymphocytic infiltrative exudations are the dominant histological features, and that in the nervous system the process follows the blood-vessels and the resultant destruction of tissues is the outcome of vessel obliteration and perivascular hæmorrhage, exudation and œdema.

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ADMINISTRATION REPORT OF THE ACTING SURGEON-GENERAL FOR TRINIDAD AND TOBAGO FOR THE YEAR 1917.

COLONIAL HOSPITAL, PORT-OF-SPAIN.

ADMINISTRATION.

Owing to the exigencies of the strenuous times through which we are passing the medical staff was kept at a minimum strength during practically the whole year, and indeed on several occasions for short periods it was below even the minimum strength. In addition to this disability the frequent temporary changes among our staff for one cause or another and the imposition on the assistant medical officers of duties unconnected with the hospital greatly hampered the management of the institution.

Although the strain has been severe and constant throughout the year and has unfortunately told on the health of almost every member of the staff, as the sick list for the year shows, I am pleased to be able to report the ready and willing response made by members of the staff to the call for increased duty. It cannot, however, be said that under the conditions referred to above the standard of efficiency has been maintained on the same high level as in previous years, although the best has been done in the circumstances.

The practice of throwing the full brunt of extra work on the hospital staff whenever the resources of the Department are strained is conducive to inefficiency and is detrimental to the best interests of the institution. The staffing of the Colonial Hospital with a fixed and adequate staff so that the institution may at no time suffer is a matter which I hope will receive careful consideration when normal conditions are restored.

Training of Nurses, Midwives, &c.—Our nurse-midwives continue to do excellent work in the town and its suburbs in connection with our extern maternity.

During the year 154 women who were unable to procure the services of a medical practitioner or certified midwife were delivered at their homes; four others were transferred for their confinement to our maternity ward owing to complications—eclampsia, transverse, face and footling presentations demanding special skill for safe delivery. Among the mothers a fatality occurred ten hours after confinement from pulmonary embolism. This case was seen by the district medical officer.

There were eleven stillbirths and six prematurely-born infants; among the latter four succumbed to debility. 4,947 visits were paid to mothers after delivery and 240 to infants after the mother had recovered from the puerperium so as to ensure their proper care and feeding. There were also 245 visits to expectant mothers to whom necessary advice was given to guide them safely to full term. Whatever may be the results of other measures adopted to conserve infant life in Port-of-Spain it is gratifying to note the marked success which attends the efforts of our nurse-midwives in the campaign to combat infantile mortality. Their work is purely preventive, and of all the measures adopted it is the most economical and practical. Apart from the saving of the lives of infants at birth, the evil is fought on educational lines by instructing the mothers in the best way of feeding and caring for their infants and by practical demonstrations not only in regard to feeding but also in respect of the general cleanliness and the clothing of the infant. In view of the encouraging results obtained at such small expenditure I would strongly urge the extension of their scope of work not only to embrace a larger area than is now within their range, but to prolong their attendance on the infant during the early months of life when infant mortality is at the highest.

Water Supply.—The water supply has been ample and of good quality.

Sanitary Arrangements.—These conform to modern ideas of sanitation, but constant supervision and vigilance are necessary to maintain them in a satisfactory condition.

Diet.—There has been no change in the diet scale of 1894. Owing to the advance in the price of every article of diet an inevitable increase of expenditure under this head has resulted.

The daily cost per bed per diem calculated on the gross expenditure for the year was 2s. 5d. The cost of maintenance per bed per diem (salaries not included) was 1s. 8d.

Accommodation.—The number of beds in the tuberculosis ward has been increased from twenty to forty, so that the institution now provides accommodation for 340 patients. Some of the chronic wards have been overcrowded to an insanitary extent during the year on account of the large number of incurable and senile cases who are sent here owing in part to inadequate provision for their accommodation at the House of Refuge and the Ariapita Asylum. This has formed the subject of a special report in which I have submitted various suggestions to prevent the degeneration of this institution into an almshouse.

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The chief diseases treated were as follows:—

Diseases	Number of cases	Number of deaths
Malaria	315	41
Enteric fever	207	41
Pulmonary tuberculosis	193	88
Ankylostomiasis	147	6
Chronic nephritis	204	68
Acute nephritis	14	3
Mitral regurgitation	57	19
Aortic regurgitation	24	9
Chronic bronchitis	82	7
Acute dysentery	50	16
Chronic dysentery	24	2
Cirrhosis of liver	79	39
Acute lobar pneumonia	71	24
Acute entero-colitis	23	16
Chronic entero-colitis	11	11
Colitis	21	4
Venereal diseases	269	12
Ulcers	273	—
Other diseases	3,211	269
	5,275	655

Mortality.—Among 5,275 patients treated during the year there were 655 deaths, or a mortality percentage of 12·41. The gross mortality rate of this institution must necessarily be high as compared with that of other hospitals in view of the large number of deaths occurring among the phthisis cases who are admitted to the tuberculosis ward in the last stage of the disease: (See above table.) Deaths among the incurable and sénile cases, for whom this institution was never intended, also go to swell unduly our mortality rate.

Surgical Operations.—There were 1,654 operations performed during the year under notice. In addition to this 1,244 minor operations were performed in the casualty.

R. SEHEULT,
Resident Surgeon.

COLONIAL HOSPITAL, SAN FERNANDO.

The Water Supply was of good quality, but its quantity was deficient towards the end of the prolonged dry season when the institution had to rely entirely on the water supplied from the Union Springs. Some temporary inconvenience was then experienced.

The Drainage within the hospital grounds is good. It is very desirable, however, that the pools of water collected along the seashore to the west of the institution, and kept by the retaining wall in connection with the railway line, should be dealt with at the earliest date possible. Mosquito larvæ (malarial type) have been found in these pools, and with the hospital—which is not mosquito-proof—situated between the town of San Fernando and the pools, it is reasonable to infer that they contribute towards the spread of malaria. During 1917 an increase in the number of malarial fever cases from the town of San Fernando has been noticed.

Sanitary Conditions.—The fly-proofing of the latrines, an urgent necessity, was completed.

The Dietary has continued to be very satisfactory when the difficulty of obtaining certain articles is taken into consideration—a consequence of the cancellation of contracts and increased cost.

Accommodation is provided for 123 patients. The greatest number in hospital in any one day was 137 and the lowest number was 87, the average being 108.

It has been found that the difficulty in restricting the admissions to hospital so as not to exceed the authorized number is increasing. The following are the chief causes which are contributing towards this condition:—

(1) An increase in the number of maternity cases. During 1916, sixty-eight cases of pregnancy were admitted. This year, 124 cases of pregnancy, in addition to thirteen cases of abortion and twenty-two cases in the puerperal stage—a total of 159 cases. Many of these patients came to hospital from a great distance and could not be refused admission; while those who resided in San Fernando invariably waited until they were advanced in labour before seeking admission, a course that precluded any possibility of their being rejected.

The supply of midwives to the town of San Fernando is inadequate to meet the demands of the public, especially the poorer classes.

(2) The admission of large numbers of advanced ankylostomiasis, dysentery, malarial fever and enteric fever cases.

The Mortality.—The total number of patients admitted was 3,074.

The total number of deaths was 356, forty-six of which occurred within forty-eight hours, and fifty-four within seventy-two hours of admission.

The mortality percentage on cases treated was 11·21.

The chief diseases treated were:—

	Admissions	Deaths
Ankylostomiasis	326	29
Venereal	315	4
Malaria	218	4
Dysentery	213	57
Respiratory diseases (excluding phthisis)	207	39
Ulcer	146	0
Chronic nephritis	144	40
Wounds	125	5
Abscess and cellulitis	115	0
Cirrhosis of liver	95	44
Enteric fever	88	29
Phthisis pulmonalis	33	10

Ankylostomiasis.—This disease was again responsible for the largest number of admissions and contributed towards the production of cirrhosis of the liver and kidneys, which latter together produced the greatest number of deaths.

Venereal Diseases—315 admissions, four deaths—were in excess of the admissions of the previous year.

Dysentery.—213 admissions, fifty-seven deaths. This disease individually contributed the largest share towards the death-rate, and the admissions were also in excess of those of the previous year.

RETURN OF DISEASES AND DEATHS IN 1917 IN THE COLONIAL HOSPITAL, SAN FERNANDO HOSPITAL AND THE DISTRICT AND YAWS HOSPITALS.

Trinidad and Tobago.

GENERAL DISEASES.

	Admissions	Deaths	Total Cases Treated
Alcoholism	13	—	13
Anæmia	35	5	38
Anthrax	—	—	—
Beriberi	2	—	3
Bilharziosis	—	—	—
Blackwater Fever	—	—	—
Chicken-pox	12	—	12
Cholera	—	—	—
Choleraic Diarrhœa	—	—	—
Congenital Malformation	—	—	—
Debility	84	19	86
Delirium Tremens	—	—	—
Dengue	—	—	—
Diabetes Mellitus	26	6	25
Diabetes Insipidus	—	—	—
Diphtheria	15	5	16
Dysentery	267	85	345
Enteric Fever	392	86	413
Erysipelas	5	—	6
Febricula	—	—	—
Filariasis	—	—	—
Gonorrhœa	287	—	336
Gout	—	—	—
Hydrophobia	—	—	—
Influenza	10	—	11
Kala-Azar	—	—	—
Leprosy	—	—	—
(*a*) Nodular	9	—	9
(*b*) Anæsthetic	11	—	11
(*c*) Mixed	9	—	9
Malarial Fever—	—	—	—
(*a*) Intermittent	—	—	—
Quotidian	—	—	—
Tertian	652	24	666
Quartan	—	—	—
Irregular	—	—	—
Type undiagnosed	—	—	—
(*b*) Remittent	61	—	65
(*c*) Pernicious	124	21	132
(*d*) Malarial Cachexia	70	5	70
Malta Fever	—	—	—
Measles	1	—	1
Mumps	—	—	—
New Growths—			
Non-malignant	—	—	—
Malignant	6	2	6
Old Age	96	23	99
Other Diseases	224	87	234
Pellagra	11	6	12
Plague	—	—	—
Pyæmia	2	—	2
Rachitis	—	—	—
Rheumatic Fever	—	—	—
Rheumatism	116	3	132
Rheumatoid Arthritis	18	—	19
Scarlet Fever	—	—	—
Scurvy	—	—	—
Septicæmia	5	—	6
Sleeping Sickness	—	—	—
Sloughing Phagedæna	—	—	—
Small-pox	—	—	—
Syphilis	—	—	—
(*a*) Primary	33	1	36
(*b*) Secondary	84	—	85
(*c*) Tertiary	108	13	117
(*d*) Congenital	24	8	25
Tetanus	23	13	23
Trypanosoma Fever	—	—	—
Tubercle—	11	11	11
(*a*) Phthisis Pulmonalis	—	—	—
(*b*) Tuberculosis of Glands	—	—	—
(*c*) Lupus	—	—	—

	Admissions	Deaths	Total Cases Treated
GENERAL DISEASES—*continued.*			
(*d*) Tabes Mesenterica	—	—	—
(*e*) Tuberculous Disease of Bones	—	—	—
Other Tubercular Diseases	—	—	—
Varicella	—	—	—
Whooping-cough	2	—	3
Yaws	1506	14	1679
Yellow Fever	—	—	—

LOCAL DISEASES.

Diseases of the—			
Cellular Tissue	422	8	445
Circulatory System	—	—	—
(*a*) Valvular Disease of Heart	33	14	36
(*b*) Other Diseases	248	86	266
Digestive System—	—	—	—
(*a*) Diarrhœa	190	60	198
(*b*) Hill Diarrhœa	—	—	—
(*c*) Hepatitis	4	—	6
Congestion of Liver	6	1	6
(*d*) Abscess of Liver	20	6	21
(*e*) Tropical Liver	—	—	—
(*f*) Jaundice, Catarrhal	5	2	5
(*g*) Cirrhosis of Liver	186	51	197
(*h*) Acute Yellow Atrophy	1	1	1
(*i*) Sprue	—	—	—
(*j*) Other Diseases	735	132	780
Ear	40	—	41
Eye	227	—	241
Generative System—	—	—	—
Male Organs	821	21	832
Female Organs	574	33	585
Lymphatic System	18	1	18
Mental Diseases	92	—	94
Nervous System	253	56	273
Nose	36	9	40
Organs of Locomotion	216	4	228
Respiratory System	932	275	981
Skin—	—	—	—
(*a*) Scabies	—	—	—
(*b*) Ringworm	—	—	—
(*c*) Tinea Imbricata	—	—	—
(*d*) Favus	—	—	—
(*e*) Eczema	31	—	32
(*f*) Other Diseases	978	21	1072
Urinary System	645	204	680
Injuries, General, Local—	—	—	—
(*a*) Siriasis (Heatstroke)	—	—	—
(*b*) Sunstroke (Heat Prostration)	3	—	3
(*c*) Other Injuries	819	37	846
Parasites—	4	—	4
Ascaris lumbricoides	24	3	24
Oxyuris vermicularis	—	—	—
Dochmius duodenalis, or Ankylostoma duodenale	755	72	782
Filaria medinensis (Guinea-worm)	21	2	32
Tape-worm	—	—	—
Poisons—	—	—	—
Snake-bites	—	—	—
Corrosive Acids	1	—	1
Metallic Poisons	5	—	5
Vegetable Alkaloids	12	—	12
Nature Unknown	—	—	—
Other Poisons	73	1	73
Surgical Operations—	—	—	—
Amputations, Major	—	—	—
,, Minor	—	—	—
Other Operations	1654	29	1654
Eye	—	—	—
(*a*) Cataract	—	—	—
(*b*) Iridectomy	—	—	—
(*c*) Other Eye Operations	—	—	—

Like enteric fever, water and flies are chiefly responsible for its increase.

Cirrhosis of the Liver and Kidneys.—219 admissions, eighty-five deaths. As previously mentioned, malaria and ankylostomiasis cannot be overlooked as primary factors towards producing these incurable conditions.

Tetanus.—Nine cases, four deaths. The admissions were double those for 1916.

Scorpion Poisoning.—Twenty-five cases, no deaths. An unusually large number of admissions; there were ten admissions in 1916. The treatment with potassium permanganate is probably responsible for the absence of deaths.

Burns.—Thirty-two admissions as compared with twelve in 1916. There were eight deaths. During the latter half of the year the method adopted at this institution has been the application of the modified Ambrine preparation (i.e., paraffin wax, &c.) in vogue in France. The results here have been more satisfactory than those previously obtained by other methods.

Eclampsia.—(*a*) A reference to the one death from this cause, which occurred in the series of twelve cases treated, is interesting in consequence of the long period which supervened subsequent to the cessation of convulsions before death occurred. A young woman, aged 19, was admitted with premonitory symptoms of eclampsia (cephalalgia, giddiness, albuminuria, &c.). Five days later she delivered normally, twenty-four hours later she developed convulsions which ceased after twenty-four hours. She then remained four days in an unconscious state before succumbing.

(*b*) An unusual condition, difficult of explanation, ought also to be recorded. A primipara, aged 20 years, was admitted in the first stage of labour suffering from eclampsia. The routine treatment was adopted, the convulsions ceased and consciousness returned twelve hours after admission. Five hours later she had a normal delivery, with no surgical interference whatever, of a full-term infant. Twelve hours later only a faint trace of albuminuria persisted. After twenty-four hours the patient suddenly collapsed and died with symptoms suggestive of serious intra-abdominal mischief.

Post mortem.—The original placental site situated at the fundus of the uterus was in a gangrenous condition and had yielded, leaving a large aperture. The specimen was submitted to the pathologist, who could render no aid in arriving at its causation.

Cancer.—A very pronounced feature of the cases admitted during 1917 was the comparatively early age at which they became victims of the disease. The ages in years were: 26, 32, 34, 44, 45, 46, 48, 49, 50, 64; average 43·9 years. It is therefore very much to be desired that the general public would realize that cancer is no longer a disease of old age, and that early surgical treatment alone offers them any possibility of obtaining relief or cure.

Operations.—These numbered 1,006 during the year. Brief mention may be made of the following cases:—

Injuries.

(*A*) *Bullet Wound Perforating Intestine.*—Laparotomy, suturing of bowel. A young East Indian, aged 23 years, was admitted to hospital at 8.40 a.m. with the history that he had been shot about 9 p.m. the previous night. On admission his general condition and pulse were bad, but with continuous saline infusion per rectum he improved. Under ether anæsthesia, his abdomen was opened and revealed the fact that the bullet had entered behind in the lumbar region to the right of the spinal column, penetrated into the abdominal cavity to the right of the ascending colon, perforated the small intestine (ileum) in two places and lodged in the anterior abdominal wall (right rectus muscle). The bullet was extracted, the wounds in the intestine closed by sutures, the abdomen washed out and drained. The wound of entrance, posteriorly, was slow in closing; otherwise his recovery was uneventful.

(*B*) *Penetrating Wound of Abdomen.*—Protrusion of bowel, reduction and repair. A boy, aged 11 years, was brought twenty miles to hospital with a wound of the abdominal wall above the bladder through which two feet of small intestine were protruding, caused by falling on the broken branch of a tree. Under chloroform the gut was cleansed, returned to the abdomen, and wound closed. A mild peritonitis, which subsided after the removal of a few sutures for drainage, developed. He left hospital six weeks later.

(*C*) *Incised Wound of Chest Wall.*—Protrusion of lung, reduction, &c. An elderly East Indian woman was admitted in a semi-collapsed and very dyspnœic condition with an incised wound on the left side of her chest cutting through the seventh and eighth ribs into the pleural cavity, a portion of lung bulging through the wound. The lung and pleural cavity, which latter contained a quantity of blood and clots, were irrigated with Dakin's solution, the lung restored and a firm pad applied. Forty-eight hours later Carrel's method of irrigation was commenced. The patient also had other severe incised wounds, one of which had divided her right clavicle and another cut through the shoulder-blade into the shoulder-joint. These latter were treated with the "Bipp" preparation. All her wounds healed very rapidly.

(*D*) *Rupture of Spleen.*—Laparotomy, tamponage. A moderately nourished East Indian was admitted from Couva with a history that a cart wheel had passed over his abdomen. On admission he showed signs of intra-abdominal hæmorrhage, and a weakening pulse. Laparotomy was performed under chloroform and ether anæsthesia and the abdominal cavity was found to contain a large quantity of blood which was washed out. The spleen—the source of the hæmorrhage—had two rents situated on the posterior border. These were plugged with a large sterilized cloth, the end of which was brought through an incision at the left subcostal margin in a similar manner to the

method adopted with the successful case described in my last year's annual report. Five days later, adhesions having formed, the cloth was removed and a drainage tube subsituted. The wound subsequently suppurated, but eventually healed completely.

INTESTINAL.

(*A*) *Intestinal Obstruction—Volvulus.*—Laparotomy. A well-nourished woman, aged 25 years, was admitted with a history of intestinal obstruction of five days' duration. Laparotomy revealed a general peritonitis with volvulus of the small intestine causing extensive thrombosis of the mesentery. A small portion of the omentum which was gangrenous had to be excised, after which her abdomen was washed out and drained. Her recovery was uninterrupted.

(*B*) *Intestinal Obstruction—Bands.*—Laparotomy. An ill-nourished woman was admitted with the history of chronic intestinal obstruction becoming acute. Five years previously she had been operated upon for a ruptured ectopic pregnancy which had been followed by general peritonitis necessitating drainage. Laparotomy demonstrated the presence of numerous bands of adhesions between the coils of intestines, while one portion of the small intestine which was constricted in two places was becoming gangrenous. This portion was resected, the gut reunited with a Murphy's button and many of the adhesions divided. Apparently paresis supervened as no action of the bowel resulted; the gut with button was therefore examined, a leakage found to have occurred, the button removed and an artificial anus instituted. Immediate relief was obtained, but though the patient improved, she relapsed and died eleven days later apparently from asthenia.

(*C*) *Acute Intestinal Obstruction—Hernia reduction "en bloc."*—Laparotomy. A man, aged 39 years, was admitted with a strangulated inguinal hernia, which was reduced by taxis. The symptoms of intestinal obstruction persisted however, and laparotomy had to be resorted to. The abdomen contained much bloody effusion and a portion of small intestine which had been reduced *en bloc*. An incision had to be made into the distended bowel to allow of the escape of some fæces and gas before reduction could be effected. After closing the wound in the gut with sutures, the abdomen was washed out and closed. He was discharged well one month later.

(*D*) *Strangulated Inguinal Hernia in a Female with Reduplicated Sac.* A stout woman, subject of mitral stenosis, was admitted with a strangulated inguinal hernia. With cocaine anæsthesia the sac was exposed and found to have a double sac. A piece of omentum which was gangrenous had to be excised. Her convalescence was rapid.

(*E*) *Artificial Anus.*—Closure and restoration to normal. This patient had been operated upon the previous year for general purulent peritonitis secondary to a ruptured pyosalpinx. Her condition later was so critical in consequence of the development of "ileus" that a temporary artificial anus was made and she gradually improved.

Under stovaine anæsthesia (five months later) the adhesions around the artificial anus were separated from the abdominal parietes and the opening in the bowel closed by two layers of sutures. The bowel was reintroduced into the abdomen and the abdominal wound repaired and closed. Her recovery was excellent, and she gained rapidly in weight.

(*F*) *Idiopathic Dilatation of Colon.*—Laparotomy. This very rare condition presented much difficulty in arriving at a diagnosis. A young girl, aged 13 years, was recommended to hospital for removal of a firm tumour in her lower abdomen. She had also a severe ankylostomiasis infection which necessitated prolonged treatment, after which her general condition rapidly improved. The tumour, which was mobile, could be pushed upwards to the liver and downwards into the pelvis. On opening her abdomen she was found to have a congenital dilatation of the descending colon, the apex of the dilatation being occupied by a large mass of impacted fæces. This was massaged downwards and the abdomen closed. No re-accumulation had occurred previous to her discharge from hospital.

(*G*) *Ruptured Duodenal Ulcer—General Peritonitis.*—Laparotomy. This man was admitted at 1.30 a.m. with the history of no action of the bowels for four days. His abdomen was very distended, pulse 104 and irregular, while vomiting and hiccoughs were persistent symptoms. At 4 a.m. his abdomen was opened and a generalized peritonitis caused by the perforation of an ulcer in the duodenum near the stomach was discovered. After flushing out the abdomen with saline solution, the perforation was tightly plugged with gauze and the upper end of the wound lightly packed with gauze around a drainage tube. Three days later the plug came away and a second one was inserted. Six weeks later the wound had completely healed.

(*H*) *Enteric Fever with Acute Gangrenous Appendix (perforation) and Peritonitis.*—Appendicectomy and drainage. A moderately nourished East Indian was admitted from Couva with general purulent peritonitis. Laparotomy revealed a gangrenous appendix which had ruptured. The appendix was removed and abdomen drained but without averting a fatal issue. *Post mortem*. There was present in addition enteric ulcers of the small intestine.

GYNÆCOLOGICAL.

(*A*) *Extra-uterine or Ectopic Pregnancies.*—Six cases:—

(1) An East Indian was admitted with a history suggestive of an extra-uterine pregnancy. Laparotomy was performed and the right Fallopian tube was found to contain a sac with blood-clots and an eight-week-old fœtus. From a small rupture in the tube blood was oozing into the abdomen. The affected tube was ligatured and removed. Her recovery followed.

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(2) An East Indian was admitted with the misleading history that after two months amenorrhœa she had an abortion ten days previous to admission. *Per vaginam* a tumour connected with the left broad ligament could be palpated. Laparotomy revealed the fact that the fluid accumulation was shut off entirely above from the abdominal cavity, the peritoneal covering of the pelvis being lifted upwards. The abdomen was closed, and *per vaginam* the cystic cavity opened into through the posterior fornix and was emptied of its putrefying fœtal elements, evacuated, and irrigated through a small Bozemann's intra-uterine canula. She was discharged well six weeks later.

(3) This was a very similar case to the last and was treated in the same manner with a like result.

(4) An intensely anæmic woman was admitted with the history of three months amenorrhœa succeeded by a profuse and prolonged menorrhagia. Her temperature was 103·8° F., pulse 132, and abdomen distended. Laparotomy showed her peritoneal cavity to be full of blood and clots, the result of a left tubal pregnancy which had ruptured. After salpingectomy of the affected tube, her abdomen was filled with saline and she slowly improved. Eight days later she developed a thrombosis of her left femoral vein, and the next day suddenly exhibited symptoms of an embolism of the lung which caused her death. *Post mortem:* A well-marked embolism was found cutting off almost the entire blood supply to the right lung.

(5) This patient was admitted from Erin with apparently general peritonitis, a thick purulent vaginal discharge and a history of regular menstruation with abdominal pains of four weeks' duration. The evidence therefore pointed to a ruptured pyosalpinx with peritonitis. Her temperature was 103·8° F., pulse thready and very fast. Laparotomy demonstrated a rupture in the left broad ligament leading into a hæmatoma between its layers. The left tube contained a sac which evidently some time previously had ruptured downwards between the layers of the broad ligament, the latter of which had given way at a more recent date into the general peritoneal cavity, the blood-clots and effusion in which were semi-purulent. Salpingectomy and drainage came too late however to save her life.

(6) The last case was that of an East Indian who was admitted with a history of an abortion but showed symptoms of intraperitoneal hæmorrhage. Laparotomy confirmed the source of the hæmorrhage to be a ruptured left tubal pregnancy. Salpingectomy was carried out. For twenty-four hours her condition remained critical, after which she rapidly proceeded to recovery.

The presence of advanced ankylostomiasis in a very large proportion of East Indian women, together with the misleading history of an abortion, renders it a matter of extreme difficulty to decide in some cases whether the patient is suffering from a leaking ectopic pregnancy or merely a severe ankylostomiasis injection with intense anæmia, slight ascites, and a recent abortion.

As failure to diagnose a ruptured ectopic pregnancy means certain death for the patient, it is now my invariable practice in such doubtful cases to infiltrate the middle line of the abdomen below the umbilicus for a distance of 2 in. with a local anæsthetic. A small painless incision is then made dividing the tissues down to and exposing a small area of the peritoneal sac, a minute incision into which at once demonstrates whether its contents is serous or hæmorrhagic. In the former case a trocar can be inserted and its contents evacuated; in the latter a general anæsthetic is at once administered and the major operation proceeded with.

(*B*) *Hysterectomy—Uterine Fibroids.*—The only case which ended fatally is of interest in demonstrating the difficulty which is sometimes encountered when arriving at a decision with regards to operative interference. An ill-nourished woman was admitted in an intensely anæmic condition suffering from severe menorrhagia due to uterine fibroids and which completely incapacitated her from pursuing any vocation. In spite of prolonged treatment for many months in hospital, it was found impossible to completely overcome the anæmia in consequence of the very profuse menorrhagia which still continued on an average for two weeks during each month. It was therefore eventually decided to operate shortly before an attack was expected when her condition was at its best. Subtotal hysterectomy was performed. Towards the end of the operation she showed signs of collapse but rallied. After coming out of the anæsthesia, she exhibited symptoms suggesting delayed chloroform intoxication (coffee ground vomitus, &c.), a consequence apparently of the anæmic condition of her blood, and succumbed eight hours later.

(*C*) *Bicornuate Uterus.—Laparotomy—Salpingectomy.*—A young girl, aged 17 years, was admitted with the history of a uterine tumour increasing in size. She was kept under observation in hospital and as her menstruation was quite regular, laparotomy was performed. A large cyst involving the terminal portion of the right Fallopian tube (whose contents had all the characteristics of retained menstrual fluid) was excised. Her uterus was bifid, the cleft which hemisected the organ extended down almost to the lower uterine segment. Her abdomen was then closed, and she has been kept under observation, but no recurrence of a blockage has been observed.

(*D*) *Congenital Absence of Cervix—Atresia Uteri.—Hysterectomy* (partial).—The case was unique in many respects. A young woman, aged 26 years, was admitted to hospital with a uterus enlarged to about the size of a five months' pregnancy. Her history was that at the age of puberty it was noticed that her condition was not normal as she never menstruated via the vagina but always and regularly via the rectum. As she suffered no inconvenience otherwise and her health never suffered she never sought medical advice. Six months

before admission to hospital all menstruation ceased, even via the rectum, a tumour developed which became progressively larger and more tender, while her health suffered considerably and she began to get thin. Examination *per vaginam* revealed an hour-glass-shaped vagina with a perfectly smooth dome and entire absence of any cervix; while bimanually the tumour above was found to be a distended uterus.

Under chloroform her abdomen was opened and the uterus was found to have been converted into a huge thin-walled cyst very much thinner at the upper (fundal) extremity; on the antero-superior aspect it was adherent to the bladder surrounded by omentum and commencing to leak. The entire dilated and attenuated portion was excised down to the openings of the Fallopian tubes until healthy uterine tissue was reached. The two halves of the uterus were then sutured together with two layers of sutures until the uterus was restored to about its normal size. A drainage tube was then inserted down to the bottom of the pouch of Douglas as it was impossible to avoid a certain amount of contamination of the peritoneal cavity with the contents of the uterus which consisted of retained menstrual fluid. After closing the abdominal wound, an artificial opening was made through the roof of the vagina into the lower segment of the uterus.

The abdominal wound eventually healed completely and the patient presents herself periodically to have the artificial opening dilated; and through which she now menstruates regularly. She has gained considerably in weight and her health has been quite restored to normal.

(*E*) *Suppurative Salpingitis with General Purulent Peritonitis.*—Three cases were admitted with the classical signs of general purulent peritonitis.

Two cases were treated by laparotomy and drainage of the abdominal cavity suprapubically, of which one ended fatally. The third case was treated by drainage of the abdomen through the vagina (postero colpotomy) with a successful result.

(*F*) *Ruptured Dermoid Cyst with General Purulent Peritonitis.*—Ovariotomy. This case, which ended fatally, was admitted from Erin in an almost moribund state. Laparotomy with excision of the cyst and drainage only succeeded in postponing her death thirty-six hours. Post mortem, her kidneys were found to be cystic.

(*G*) *Ruptured Ovarian Abscess with General Purulent Peritonitis.*—The condition of this patient on admission was found to be very similar to the previous case. Laparotomy revealed the cause to be an abscess of the ovary which had burst. Removal of the diseased organ with drainage ended in recovery.

During the year very gratifying results have been obtained in the treatment of septic wounds, especially compound fractures, by either a modified Carrel's method of irrigation with Dakin's solution or by the application of Rutherford Morrison's "Bipp" paste. The former is utilized in very purulent cases and the latter when the sepsis is slight.

E. A. Turpin,
Resident Surgeon

Lunatic Asylum.

Admissions, Discharges, Deaths.—The admissions were forty fewer than in the previous year, the decrease being nearly equally divided between the sexes. Cases about 65 years of age were also below the average number, while admissions under 21 years of age were more numerous than usual. Inquiry into the history of the admissions disclosed that (*a*) only seventeen were known to be relapsed cases; (*b*) the duration of mental disorder before admission had probably not exceeded three weeks in over 50 per cent. of the cases; (*c*) insane heredity or obvious congenital defect existed in 45 per cent., the real proportion being probably much higher; (*d*) alcoholism and mental stress (not apparently due to war conditions) were the chief exciting causes of the mental disorder.

The proportion of relapsed cases among the admissions continues to diminish—probably a result of the tendency of recent years to bring mental disorder earlier under asylum treatment, leading in many cases to more stable if not earlier recovery. It is, however, the number of "first attack" cases which affords the real index to the incidence of insanity in a community, and although there were thirty-one less than in the previous year, the average of the past three quinquennial periods shows no tendency to decrease, the extent to which inherited predisposition enters into causation being rather more marked each period.

The percentage of recoveries on admissions was the highest since 1909. This increase which was more marked among the females may be attributed to the more favourable character of the admissions during the past two or three years. In more than half of the recoveries the duration of residence in the institution exceeded eighteen months. It is impolitic to regard mere subsidence of mental disorder as recovery or fitness for discharge. The benefits of prolonged treatment in the institution associated with regular hours and freedom from responsibility are reflected in a reduced relapse rate.

The deaths numbered eighty-six and included twenty-eight from pulmonary tuberculosis and eleven from dysentery (colitis). The percentage (12·18) of deaths on the average number resident was the lowest for the past five years.

In spite of the occurrence of mild chicken-pox among the patients and staff and of four cases of typhoid fever the general health of the institution was fair.

The high average of work attained in recent years was well maintained with regard to indoor as well as outdoor employment. The cultivation of ground provisions was largely extended and the yield was double that of the previous year.

Geo. A. Vincent,
Medical Superintendent.

Cocorite Leper Asylum.

On December 31 the population of the asylum was 502, consisting of 304 men, 32 boys, 140 women, and 26 girls. The general accommodation of the institution therefore will be seen to be inadequate to meet the increase in the number of patients, and consequently temporary arrangements had to be made by using verandas and other available space.

The buildings are in good condition and the grounds kept in good order.

The water supply is efficient and the water of good quality and ample.

No changes have been made in the dietary. The meal hours of the prison have been altered to fit in with those of the asylum.

General Remarks.—One birth from a leper mother outside and one inside are noted. Both children were born healthy. There were the usual number of cases before the magistrate. The prison is now under control of the Prison Department. The new latrine by the infirmary should have been placed farther away. Concerning absconding, under the existing conditions this cannot be bettered. Even if absolute segregation were enforced escapes of inmates could easily be effected. The grounds are still not efficiently illuminated at nights, and the sickly lights allowed the wards can do no more than make darkness visible. Therefore it is desirable that an installation of the electric light should be made.

Charles W. Howatson,
Medical Superintendent.

St. Augustine Yaws Hospital.

Water Supply and Drainage.—The water supply and drainage are both unsatisfactory. A large sum is paid annually for water, whereas the large roof of the hospital could supply all that is needed if a cistern were built.

Concrete drains are needed in front of the building.

The diet scale is satisfactory, but beef and provisions were at times unobtainable.

There were two prosecutions for misbehaviour in hospital. Six patients absconded.

Isolation rooms for the segregation of infectious diseases are required to be built apart from the hospital.

There were 1,203 admissions during 1917, and the number admitted since the opening of the hospital is 11,596.

Deaths 13, from the following causes: Tuberculosis, 1; dysentery, 5; abscess and anæmia, 1; meningitis, 1; worms, 1; dysentery and Bright's, 1; influenza, 1; senility, 1; cardiac failure, 1. Two of these cases were not injected. Two deaths, one from abscess and the other from meningitis, I think were results of the injection.

There was an epidemic of varicella which started in January and ended in August. The total number of cases was 156. If there were proper means of isolation it is probable that the epidemic would have been checked earlier. Five lepers were admitted and subsequently transferred to the Leper Asylum.

The hospital has been overcrowded often during the year. This overcrowding is not conducive to the welfare of the institution and the inmates, from a disciplinary point, nor from a sanitary.

J. Aldric Perez,
D.M.O. St. Joseph.

Colonial Medical Reports.—No. 111.—Cairo.

REPORT OF THE MEDICAL OFFICER OF HEALTH CAIRO CITY, FOR THE YEARS 1915 AND 1916.

By J. FERGUSON LEES,

Medical Officer of Health, Cairo City.

Vital Statistics.

For 1916 the population was estimated at 740,000, consisting of 665,000 Egyptians and 75,000 foreigners.

During 1915, 29,933 births occurred in Cairo. The annual birth-rate was therefore 40·8 per thousand of the population, as compared with 43·1 per thousand in 1914.

Of these 451 were foreigners.

In 1916 the number of births was 31,170, making an annual birth-rate of 42·1 per thousand of population, as compared with 40·8 per thousand in 1915.

Of these 456 were births of foreigners.

The total number of deaths occurring in Cairo during the year 1915 was 32,554. This gives an annual death-rate of 44·3 per thousand of the population, as compared with a rate of 36·0 per thousand for 1914.

In 1916, the total number of deaths in Cairo was 28,320. This gives a death-rate per thousand of the population of 38·3, as compared with a rate of 44·3 in 1915.

Of children under the age of 1 year, 9,592 died in Cairo in 1915. This gives an infantile mortality rate for the whole city of 320 per thousand births, as compared with 283 per thousand in 1914.

In 1916, 9,208 children under the age of 1 year died in Cairo. The infantile mortality rate per thousand births was therefore 295 in 1916, as compared with 320 in the previous year.

The principal causes to which the infantile deaths in 1915 and 1916 were attributed were, as usual, diarrhœa, enteritis and marasmus.

Infectious Disease

During the year 1915, 11,422 cases of infectious disease were recorded in Cairo, as against 5,413 in 1914; 4,161 in 1913; and 2,895 in 1912. This enormous increase in 1915 over the previous year's figures is such as to call for special consideration.

In 1914 the increase was largely due to increased discovery of cases, but also partly due to the occurrence of an epidemic of small-pox.

In 1915, of the total of 11,422 cases of infectious diseases recorded, approximately three-fifths were reported as cases of typhoid fever.

The year 1915, from an infectious disease point of view, may therefore be considered as characterized by an undue prevalence of typhoid fever, and of a disease presenting such a close resemblance to typhoid fever that almost all the cases were originally notified as the former disease.

The total cases and the morbidity rates of the eight principal notifiable diseases recorded in 1915 show a very considerable increase over those of the previous years. As regards these figures, however, the effect of the increased measures of control applied since 1912 has so interfered with the recorded annual totals as to render a free acceptance of them as a basis for the comparison of zymotic incidence in the various years unjustifiable, and to call for some analysis of the results before arriving at any conclusion.

Typhoid Fever.—During 1915 the number of cases of typhoid fever attributed to Cairo was extremely high, there being a total of 2,378 cases, giving a morbidity rate of 3·242 per thousand of population, as compared with 1·941 per thousand in 1914, 1·017 per thousand in 1913, and 0·642 in 1912. The number of deaths was 1,012, giving a death-rate per thousand living of 1·379, as compared with rates of 0·428 in 1914, 0·313 in 1913, and 0·248 in 1912

This increased death-rate was not, however, altogether unexpected

As has already been indicated, in the beginning of 1915, with the advent, first, of an undue prevalence of typhoid fever and later of the epidemic of the unidentified fever already referred to, the situation as regards the public health of the city became such as to call for the application of exceptional measures.

Both diseases were occurring principally in the more poverty-stricken quarters, where the conditions of home life were such as to render any home control impossible, and a considerable proportion of the cases had therefore to be removed to hospital. The increased death-rate from this disease, therefore, may largely be attributed, in the manner previously spoken of, to this action, which from the nature of the disease, substituted, in the case of a considerable proportion of its deaths, the certainties of hospital diagnosis for the possibilities of missed post-mortem identification of the cause had the case only been seen after death.

The Unidentified Fever of 1915.—The most prominent feature in 1915, from a zymotic point of view, was the extensive outbreak of an unidentified fever, which began in March and ended in August or September.

Certainly none of the twenty-three hospital cases, which were recorded in the last three months as possible cases of the disease in question, could be taken as typical examples of those which had previously been diagnosed as such, and it is almost certain that, without the previous occurrence of the unidentified fever, these would have been adjudged merely somewhat atypical cases of typhus. I am afraid, therefore, that as regards these later cases the wish was to some extent father to the thought, and that the desire to find examples for a continuation of the investigations produced a tendency to record cases certainly open to doubt as actual cases of the disease. As, however, the number of typhoid notifications in the last three months was unimportant, it was considered, for reasons of continuity, advisable to continue to show the estimates as based on the hospital figures.

As already indicated, circumstances did not admit of sufficient investigations to determine the nature of the disease, but certain facts have been recorded in an appendix to this report.

Typhus Fever.—The number of cases of typhus fever recorded in 1915 was 1,112 cases, giving a morbidity rate of 1·516 per thousand of population, as compared with rates of 0·483 per thousand, 0·301 per thousand, and 0·329 per thousand in 1914, 1913, and 1912 respectively.

It is difficult definitely to state to what extent the increased rate in 1915 is to be taken as indicating an actual increase in incidence, inasmuch as the figures for this year are undoubtedly inflated by the inclusion of a large number of cases which were incidentally brought to light in the course of the special investigations regarding concealed cases of typhoid and the unidentified fever.

The death figures for this year are, however, undoubtedly erroneously high as a result of a known source of error affecting one district, but discovered too late to permit of any satisfactory basis of readjustment.

Relapsing Fever.—The number of cases of relapsing fever recorded in Cairo in 1915 was 456, giving a morbidity rate of 0·621 per thousand of population, as compared with rates of 0·013, 0·029, and 0·052 per thousand in 1914, 1913, and 1912 respectively.

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There were eighteen deaths, giving a death-rate of 0·024 per thousand living, as compared with 0·001 in 1914, 0·006 in 1913, and 0·004 in 1912.

Though these figures would appear to indicate an increase in the incidence of this disease in 1915, there was nothing to suggest that an explanation of the increased figures need be looked for further than in a larger proportion of discovered cases found in the course of inquiries into concealed cases of unidentified fever.

Diphtheria.—During 1915 there were recorded 1,286 cases of diphtheria, giving a morbidity rate of 1·753 per thousand of population, as compared with rates of 1·945, 1·827, and 1·573 for 1914, 1913, and 1912 respectively. Of the 1,286 cases, 462 died, making the death-rate for the disease 0·629 per thousand living, as compared with 0·943 in 1914, 0·785 in 1913, and 0·748 in 1912. The ratio of deaths to cases recorded was 35·9 as compared with 48·5 per cent. in 1914, 42·9 per cent. in 1913, and 47·6 per cent. in 1912, a diminution in the ratio for 1915, which suggests an improved position as regards the discovery of cases.

The disease showed its usual seasonal prevalence, being most marked in the autumn, reaching its maximum at the end of October, and being lowest in April, May and June.

Measles.—During 1915 the incidence of measles was low, only 363 cases being registered, giving a rate of 0·494 cases recorded per thousand of population, as compared with 0·646 per thousand in 1914, 1·518 per thousand in 1913, and 1·085 per thousand in 1912.

The highest weekly record of cases was in April.

The ratio of deaths to cases recorded for the whole city was 30·3 per cent. as compared with 26·4 in 1914.

Small-pox.—The number of cases of small-pox recorded in 1915 was only fifty-nine, giving a morbidity rate for the disease of 0·080 per thousand of population, as compared with rates of 1·354, 0·385, and 0·096 in 1914, 1913, and 1912 respectively.

The number of deaths was twelve, giving a death-rate for the disease of 0·016 per thousand living, as compared with death-rates of 0·249, 0·069, and 0·022 in the three previous years.

In my report for the previous year I entered at some length on the reasons upon which was based a decision in 1914 to include chicken-pox in the small-pox records. In a year such as that, which was characterized by an extensive epidemic of small-pox, the proportion of cases wrongly reported as chicken-pox was found to be so extremely large that the inclusion of the small number rightly so diagnosed amongst the small-pox figures had little material effect on these.

In 1915, however, no undue prevalence of the graver disease occurred, and there was nothing to indicate that any of the 143 cases notified as chicken-pox in 1915 were other than as labelled.

Cerebrospinal Fever.—The incidence of this disease in 1915 was lower than in any year since I have been in charge of Cairo, the total number of cases recorded, being only fifty-three, with twenty-six deaths, giving a ratio of deaths to cases recorded of 49·05.

The majority of the cases occurred in March, April and the beginning of May.

Scarlet Fever.—Only thirty-seven cases of scarlet fever were recorded in 1915, giving a morbidity rate of 0·050 per thousand of population, as compared with 0·135 per thousand in 1914, 0·233 per thousand in 1913, and 0·151 per thousand in 1912.

Of the thirty-seven cases, seven died, giving a death-rate for this disease, in 1915, of 0·009, as compared with 0·012 in 1914, 0·037 in 1913, and 0·032 in 1912.

The ratio of deaths to cases recorded was 18·9 per cent.

Puerperal Fever.—During 1915 there were eighty-five deaths recorded from puerperal fever. Of these, eighty-one were deaths of Egyptian women and four of European.

These eighty-five deaths give a death-rate of 0·115 per thousand of population, as compared with 0·066 per thousand in 1914, and 0·103 per thousand in 1913.

Calculated on the number of births the maternal death-rate from this cause per thousand births was 2·839, as compared with 1·532 in 1914 and 2·34 in 1913.

Considering the parturition conditions in this country amongst the lower classes, these rates are remarkably low and compare very favourably with countries where the conditions are much more advantageous.

In addition to the eighty-five deaths actually certified as from puerperal fever, thirty-two deaths of parturient women were noted as occurring within a period of fifteen days after confinement. The causes of death assigned in these cases were: Hæmorrhage, eight; tuberculosis, two; dysentery, one; ruptured uterus, one; difficult labour, three; heart disease, one; adherent placenta, one; typhus, one; typhoid, three; uræmia, one; nephritis, one; abortion, three; peritonitis, one; and eclampsia, five. Possibly some of those cases ought rightly to have been certified as puerperal fever, but even if we include them all with the eighty-five deaths actually reported as from that cause, the total of 117 deaths only gives a rate for deaths in connection with parturition of 0·159 per thousand of population, or a maternal death-rate per thousand births of 3,903, a result which must be rather surprising to anyone aware of the circumstances surrounding parturition amongst the lower classes in the country.

Typhoid Fever.—In 1916 there were 1,462 cases of typhoid fever recorded in Cairo, as against 2,378 in 1915. The 1916 morbidity rate from this disease was therefore 1·975 per thousand of population, as compared with 3·242 in the previous year.

There were 632 deaths recorded from this cause, the death-rate in 1916 being therefore 0·854 per

thousand living, as against a rate of 1·379 in 1915.

If reference be made to the description of the disease for 1915 it will be seen that, in that year, Old Cairo, of all the other districts, showed the lowest morbidity rate and one of the lowest death-rates. This position was almost certainly entirely fictitious, and was undoubtedly due chiefly to a concealment of large numbers of cases.

An increased discovery of cases in the present year furnishes, in large part, the explanation of the altered position in which this district finds itself in 1916, not only with regard to typhoid fever, but to typhus and relapsing fever as well.

The weight to be attached to the ratios of deaths to cases recorded as indices of relative case detection has been so modified by the comparatively greater increase in the discovery of cases likely to prove fatal, that its value is somewhat problematical in diseases such as typhoid, typhus, and relapsing fevers, where the post-mortem external appearances present no obvious characteristics.

Typhus Fever.—During 1916, 1,858 cases of typhus fever were recorded in the city, giving a morbidity rate of 2·510 per thousand of population, as compared with a total of 1,112 cases and a morbidity rate of 1·516 in 1915.

Of the cases recorded, 1,075 died, giving a death-rate of 1·452, as compared with a total of 718 deaths, and a death-rate of 0·978 in 1915. The ratio of deaths to cases recorded in 1916 was 57·8 per cent., which was somewhat lower than the 64·6 per cent. of 1915. Both ratios, however, have been subject to the influences already described, and it is to be remembered, in connection therewith, that typhus fever is one of the diseases most likely to be affected thereby.

Relapsing Fever.—During 1916, 1,035 cases of relapsing fever were recorded in Cairo city, giving a morbidity rate of 1·398 per thousand population in 1916, as compared with a rate of 0·621 in the previous year. Of the cases occurring in 1916 there were fifty-nine deaths, giving a death-rate for this disease of 0·079 per thousand of population, as compared with a death-rate of 0·024 in 1915.

The ratio of deaths to cases recorded was 5·7 per cent., as compared with 3·9 per cent. of the previous year, but the smallness of the figures and the fact that the influences, already described as tending to an increase of this ratio, may have acted with varying effect in the two years renders any deductions based on their comparison open to objection.

Diphtheria.—There were 836 cases of diphtheria registered in Cairo city during 1916, with a morbidity rate of 1·129 cases per thousand inhabitants, as compared with a rate of 1·753 in 1915.

There were 335 deaths recorded from this disease, giving a death-rate of 0·452 per thousand living, as compared with a rate of 0·629 in 1915.

The ratio of deaths to cases recorded was 40·07 per cent. of deaths recorded in 1916, as compared with 35·9 per cent. in 1915.

Measles.—During 1916, 1,222 cases of measles were recorded in Cairo, giving a morbidity rate of 1·651 per thousand of population, as compared with 0·494 in 1915.

There were 607 deaths, giving a death-rate for this disease of 0·820 per thousand living, as compared with a death-rate of 0·149 in 1915.

The ratio of deaths to recorded cases was 49·6 per cent., as against 30·3 per cent. in 1915.

Small-pox.—In 1916 there were 277 cases of small-pox recorded in the city, giving a morbidity rate of 0·374 per thousand of population, as compared with a rate of 0·080 per thousand in 1915. The number of deaths from this cause was 103, with a death-rate of 0·139 per thousand living, as against a rate of 0·016 in 1915.

During 1916, 162 cases were notified as chicken-pox. There was nothing to suggest that these were otherwise than reported, but in discussing the incidence of small-pox in 1915, reference was made to the possible utility of charting the relative seasonal prevalence of chicken-pox in comparison with that of small-pox, in years when a comparative paucity of cases permitted of some confirmation of the individual diagnoses, with the view of obtaining information as to possible differences of seasonal incidence such as might provide assistance during excessive prevalence of one or other of the diseases in checking the fallacious diagnoses of chicken-pox frequently made in order to avoid hospital isolation.

Cerebrospinal Fever.—In 1916 there were thirty-three cases of cerebrospinal fever recorded in the city with a morbidity rate of 0·044 per thousand of population, as against 0·072 in 1915. The deaths recorded were twenty-three, showing a death-rate from this cause for the whole city of 0·031, as compared with 0·035 in 1915. The ratio of deaths to cases recorded in 1916 was 69·6 per cent., as against 49·05 in 1915.

Scarlet Fever.—During 1916 there were recorded in Cairo city forty-eight cases of scarlet fever. The morbidity rate was therefore 0·064 per thousand of population, as against 0·050 in 1915. Two of the cases died, giving a death-rate of 0·002 per thousand living, as compared with a death-rate of 0·009 in 1915.

Puerperal Fever.—In 1916 the number of deaths certified as from puerperal fever was seventy-five, of which seventy-three were deaths of Egyptian women and two of European. The death-rate for this disease, therefore, per thousand of the general population was 0·113, as compared with 0·115 in 1915. Estimated on the birth figures for the year, the maternal death-rate from puerperal fever was 2·406 per thousand births, as compared with 2·839 in 1915. The rates for this disease in Cairo are therefore low.

With the object of checking the correctness of the figures, special note has been taken for the last three years of deaths of all women dying within fifteen days of their confinement, but even if all such cases were included as puerperal fever, the position would still be far from unsatisfactory, especially in view of the circumstances generally surrounding the parturient woman in this country.

Thus, in addition to the seventy-five deaths declared as from puerperal fever, twenty-nine other maternal deaths occurred within fifteen days of confinement. The causes of death assigned in

these cases were: Uræmia, five; peritonitis, two; eclampsia, four; nephritis, one; dysentery, one; difficult labour, one, hæmorrhage, nine; typhus, three; heart disease, one; and tuberculosis, two.

The provision of ambulance transport, as regards materials and personnel, remained the same as in 1913.

With the additional demand, however, made on this service as a result of the increased number of infectious cases now dealt with, considerable difficulty has at times been experienced in meeting all demands, and in 1915 the number of conveyances had to be augmented by two motor ambulances lent by the Military Authorities. Without these it would have been impossible to cope with the very considerable calls for infectious transport which occurred in the summer of 1915, as a result of the extensive prevalence of infectious disease at that time.

The primary duty of the service is naturally the provision of transport for the infectious sick, but it is expected to provide, in addition, for the carriage of dog-bitten persons undergoing treatment at the Antirabic Institute, between that place and Qasr el 'Aini Hospital, and to supply conveyance for non-infectious sick when these are called for.

The requirements of the city as regards the last are, however, ably met by the very efficient service provided for this by the *Association Internationale d'Assistance Publique*, and, with the exception of the period in 1915 when the unusual demands for infectious transport necessitated the assistance of the Military Authorities, it has been possible for us so far to meet all calls for the removal of the infectious sick by limiting the service to this as far as possible.

Prosecutions.—At the end of August, 1914, the promulgation of the law decreeing the establishment of maximum tariffs for foodstuffs and articles of prime necessity, by making it an offence to refuse to sell at the tariff price fixed, enabled us to deal more systematically with dishonest milk dealers who had hitherto been able to evade, to a great extent, the consequences of their dishonesty, as a result of the difficulties previously attending the obtaining of the samples required for examination.

Prior to the application of this law, the formalities of purchase necessary for a successful prosecution served as a warning to the vendor of the purpose for which the purchase was intended, and resulted usually in a refusal to sell whenever the milk had been adulterated.

Under Article 4 of the new law, however, refusal to sell at the tariff price itself is an offence, and vendors of milk have therefore now to supply the sample required on the legal price being tendered, or render themselves liable to prosecution.

Taking advantage of this, on August 29, 1914, arrangements for a systematic examination of milk samples were put in operation.

Generally speaking, therefore, it may be said that the decrease in the number of prosecutions may, in the main, be taken as an indication of the marked improvement in the position which has resulted from an increased stringency of control, to which reason may also, to a great extent, be attributed the general diminution in other classes of prosecutions such as those dealt with under the vaccination and infectious disease laws, though these, however, are more exposed to accidental influences rendering any assessment of the extent to which this might have occurred too open to criticism for discussion to serve any useful purpose.

There has, since 1912, been a marked and progressive decrease in the number of cases filed in each year, and coincident with this a similarly progressive increase in the percentage of convictions obtained.

Sanitary Control of Public Women.

As a result of special circumstances arising out of the war, certain alterations have been made in the arrangements for the registration and examination of prostitutes, which it will be desirable to refer to briefly before proceeding to a presentation of the position, as regards the subject, for the years 1915 and 1916.

Anterior to the war, under the powers conferred by the civil laws, all brothels were required to be licensed and their occupants, irrespective of nationality, registered and submitted to a weekly examination, either at the central *Bureau* or at one of its two branches.

Thus far in the arrangements no distinction was drawn between native and foreign prostitutes, save possibly such as might result from the general difficulties attending the free application of any regulations to foreigners. Beyond this point, however, differences occurred and the law ceased to be of uniform application.

In the case of native prostitutes, the control suggested by registration and periodical examination was carried to its logical conclusion by the segregation and treatment of their sick in the special Lock hospital. As regards such women, therefore, the arrangements in force permitted of some practical effort being given to the general idea upon which a State control of vice is based.

On the other hand, the sanitary control of foreign prostitutes was merely nominal. It is true that a certain proportion of them, living in licensed brothels, were registered and submitted to a weekly examination, but the effect of this, in the prophylaxis of venereal disease, was almost entirely neutralized by the absence of powers of compulsory isolation and treatment in cases of disease. Attempts were made to curtail the activities of such diseased women by the withdrawal of their cards of registration, with the object of preventing them from frequenting recognized brothels. Apart, however, from the difficulties in actual practice of enforcing this prohibition, its object, from a health point of view, was almost entirely defeated by the existence of numerous low-class hotels and *maisons de passe*, affording such facilities for assignation as

gave ample opportunity to diseased foreign prostitutes for an uninterrupted continuation of their usual mode of life.

In order to remove this anomalous situation, and to permit of the extension of control to the inmates of such houses of ill-fame as had previously escaped this under the shelter of a foreign nationality, towards the end of 1914 a meeting of the various Consuls in Cairo was convened by His Britannic Majesty's Consul, at the request of the Commandant of Police acting on instructions from the Military Authorities. This was held on December 23, 1914, when the request for the additional powers necessary was acceded to, and it was agreed that the same control as had previously been applicable to native prostitutes should be extended to foreigners, subject to this condition, however, that some consideration should be given to the differences of habit and mode of life as between the European and Egyptian women, by providing the former with special hospital accommodation in which treatment would be given by European doctors, and the living arrangements made such as would be more in conformity with European habits than would be the case in a native hospital.

In giving effect to this decision, arrangements were made for the establishment of a new *bureau des mœurs*, hospital, and medical examination room in El Ezbekiya quarter for the purpose of dealing solely with foreign prostitutes, the old *bureau des mœurs* and examination rooms already mentioned being then reserved for work in connection with the examination and control of public women of Egyptian nationality.

The new hospital and examination room were started in February, 1915, with a provision of thirty-five beds for in-patients. This accommodation, however, proving insufficient, forty-nine more beds were added, subsequently bringing the in-patient capacity of the hospital up to eighty-four beds.

At first the hospital was administered under a somewhat complex arrangement with a military medical officer in charge of the medical work, expenses met from the Suspense Account of the Egyptian Government, and the Police Administration in general charge, whilst a vague and ill-defined responsibility rested on this office, through which the hospital accounts were passed.

This co-operative system, however, with its ill-defined spheres of activity, did not prove an administrative success, and the control of the hospital, as it stood, with the work of the examination rooms, was finally taken over by us at the end of 1916. Previous, however, to this assumption of definite control, this office, as the channel of financial communication, had of necessity been more or less in touch with all arrangements for the control of foreign prostitutes, and the review of the medical part of this control has therefore been included in the present report, though during the greater part of the time the work was not nominally under our charge.

With the extension of the scope of supervision of foreign prostitutes which resulted from the greater powers of control thus obtained, and with the administrative distinction between native and foreign women demanded by the extension, a necessary readjustment of the arrangements obtaining in previous years has rendered the figures for 1915 and 1916 scarcely comparable with those of antecedent records, unless certain allowances be made for the modifications introduced.

Coincident with the application of a more stringent control to all recognized public women, the desirability was suggested of imposing some sort of supervision over that large class of women, chiefly employed in connection with places of entertainment and for the most part residing in special "pensions," who submit themselves to occasional or partial prostitution. This desire was met at first by requiring the weekly submission, by each woman, of a certificate of good health from a private practitioner recognized by this office. Though absolute efficiency of control could scarcely be claimed for such a method, it had the certain advantage of affording information upon which individual action might have been based if this were called for.

In August, 1916, however, it was decided to discontinue this arrangement and to substitute for it a more definite control by registration and weekly examination.

As was to be expected from a measure of such doubtful expediency as the fresh arrangement seemed likely to prove by its indiscriminate application to women submitting themselves to the practice of a merely casual prostitution, innate objections to its employment soon manifested themselves and wisely led to an early discontinuation of an inadvisable procedure. During the brief period, however, when the arrangement was in force, these women were submitted to a regular examination in no way differing from that imposed upon regular prostitutes, except that some allowance was made for the greater delicacy of feeling likely to be met with in the case of the occasional prostitute than is usually found in the more hardened habitual practitioner, by the provision of a separate centre for the examination of the former.

In deference to an undertaking given to the women by the authority concerned in making the arrangements, no definite medical records of the results of the examinations are available for this report.

(a) Examination of Native Prostitutes.

During the course of the year, 1,513 women were found suffering from syphilis or gonorrhœa. Of this number, 1,117 were cases of gonorrhœa and 396 of syphilis. All were sent for treatment to the Lock branch of Qasr el 'Aini Hospital at Hôd el Marsûd.

During 1916, the names of 2,049 women were borne on the registers, including the 1,143 remaining from the previous year.

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Of these, 670 were struck off during the course of the year, leaving 1,379 names on the books of the old *bureaux des mœurs* at the end of 1916 to be carried on to the following year.

During the year, 1,203 cases of syphilis and gonorrhœa were discovered, 795 of these being cases of gonorrhœa and 408 of syphilis.

The comparative figures show that the general increase in the number of native prostitutes registered in 1916, as compared with the previous year, was derived from an increase in the prostitute population of the two quarters in closest proximity to military camps, or most frequented by soldiers, whilst an actual diminution took place in the other two quarters.

(B) Examination of European Prostitutes.

There were 706 women inscribed on the registers of the European *bureau des mœurs* in 1915.

Diseased conditions were found, upon examination, in 525 cases in 1915 and in 896 in 1916.

It may be mentioned, however, that, obviously as a result of continued neglect and lack of ordinary cleanliness, the local conditions found on the examination of a very large proportion of the previously unregistered European prostitutes then brought on the register were truly deplorable, and compared very unfavourably with those found in the case of native and previously registered European prostitutes.

Associated with, and, to some extent, the indirect result of these unsatisfactory conditions, which in themselves constituted a deviation from health, were many neglected cases of actual disease, which, existing to a relatively much greater degree amongst the previously unregistered European prostitutes than was the case generally, contributed to an expectation of greater frequency of disease in the former case, subsequently justified by the numerical results.

The ultimately improved position in these cases, as regards the conditions found, furnished an interesting example of one of the few undoubted advantages which may be generally conceded to the control of prostitution in the prophylaxis of venereal disease. Apart altogether from the improvement which resulted from medical interference in those cases which actually called for this, a distinct general amelioration of the unsatisfactory conditions originally existing resulted from the weekly cleansing and preparation to which almost all the women had obviously submitted themselves before appearing for their examinations.

(C) European Lock Hospital.

During 1915, 525 European prostitutes were treated in the European Lock Hospital, of whom 13 were suffering from syphilis, 357 from gonorrhœa, 58 from chancroid, and 11 from labial abscesses, whilst 86 under suspicion were admitted for observation.

Of the thirteen cases of syphilis, eight were in the primary stage and five in the secondary.

Of the 357 cases of gonorrhœa, only four were noted as acute, the remaining 353 being returned as cases of chronic gonorrhœa. Many of these latter, however, might have been more properly described as cases of vaginal discharge, largely resulting from neglect and want of ordinary cleanliness, but showing, on examination, the presence of gonococci. Such cases were found to clear up rapidly under appropriate treatment.

The average stay of each patient in hospital was 14·8 days for all cases.

For the syphilitic cases, the average period of detention was 49·3 days, that for the primary cases having been 32·3, and for the secondary 76·6 days.

The average period of detention of the patients suffering from gonorrhœa was 17·0 days, that for those suffering from the acute form having been 30·5, and that for those returned as chronic gonorrhœa 16·9 days.

For the cases of chancroid, the average stay in hospital was 12·2 days, whilst the period for patients admitted with small abscesses of the labia was 11·0 days.

Patients under observation, subsequently found free from venereal disease, underwent a period of detention of three days on an average.

The number of patients admitted to the European Lock Hospital in 1916 was 896. Of these, 35 were suffering from syphilis, 729 were cases of gonorrhœa, 43 had chancroid, 53 were cases of labial abscess, whilst 36 suspicious cases were detained under observation, but subsequently discharged as free from disease.

Of the thirty-five cases admitted as syphilis, nine were in the primary stage and twenty-six in the secondary.

Of the 729 cases of gonorrhœa, 15 were returned as acute, 34 as subacute, and 680 as chronic.

The average stay of each patient in hospital in 1916 was 19·3 days for all cases.

For the cases of syphilis the average period of detention was 42·2 days, that for the primary cases being 49·2, and for the secondary 39·8.

The patients returned as gonorrhœa were detained on an average 20·1 days, the various periods of detention having been 30·4 days for the acute cases, 21·5 for the subacute, and 19·8 for the cases returned as chronic.

The average stay of the chancroid cases was 12·1 days, and of the cases of labial abscess 9·8 days.

The average period of detention under observation for patients subsequently found free from disease was three days.

Unhealthy, Inconvenient and Dangerous Establishments.

Formerly, the chief difficulty experienced in dealing with the establishments licensed under the Law of August 28, 1904, resulted from the lack of a subsequent efficient control.

The powers conferred by law of laying down conditions, and the initial verification of their application before any issue of a licence, enabled us primarily to start these establishments with some approach to a satisfactory condition, but the absence of any provision for a regular systematic inspection to ensure subsequent compliance with the conditions imposed resulted in a gradual falling away from initial standards in the great majority of cases.

Spasmodic inspections at irregular intervals had, it is true, some slight effect, but the infrequency of the visits, combined with the smallness of the penalty for failure to observe the conditions, rendered efficient control impossible.

In 1914, however, the provision of a small staff, specially for the purpose of supplying means for a subsequent control, permitted of a start being made in this direction.

It was considered advisable, however, in taking advantage of this, to confine the activities of the new service to the control of those establishments which were of prime importance from a public health point of view, rather than to attempt to deal with the whole question, and thus impair the efficiency of control by a diminution in the frequency or regularity of the visits.

Acting on this principle, it was decided, in 1914, to limit the inspections at first to such establishments as dealt in foodstuffs and drinks, and this arrangement was continued in 1915 and 1916.

The figures for the three years, therefore, during which the inspections have been in force, show a gradual tendency towards improvement, the percentage of visits at which unsatisfactory conditions were found having diminished from 17·2 per cent. in 1914 to 14·2 per cent. in 1915, and 6·8 per cent. in 1916.

This improvement is in reality even more marked than is shown by the figures, as, in the first year of the new arrangement, it was not considered politic that full advantage should be taken of this in any way such as would operate needlessly with sudden or undue harshness on the establishments concerned, and many faults not of a pressing nature were, for the time being, overlooked.

From this it will be seen that the general improvements in the conditions found applied broadly to all the individual establishments, and, generally speaking, shows a marked advance in each year over that of its predecessor.

In all cases where conditions were found unsatisfactory, the proprietor of the establishment was warned, and a time limit fixed within which the necessary improvements had to be carried out, failure to comply being followed by legal proceedings.

With the assistance of the Military Authorities, pressure was brought to bear on the proprietors of certain of the older soda-water factories in which the conditions of exploitation left much to be desired. A notice of the conditions generally applicable to mineral water factories was served on the proprietors of all such establishments, and a time limit fixed for each within which whatever alterations were necessary should be carried out, if such were called for.

A warning was sent at the same time to the effect that failure to comply would result in a prohibition of all supply of the mineral water concerned to troops, and would entail the putting out of bounds of any establishments selling or keeping such mineral waters.

This resulted in a considerable improvement, and an attempt has been made to preserve the higher standard thus attained by a bi-monthly inspection of each establishment.

Anti-mosquito Service.

The arrangements for dealing with mosquitoes in 1915 and 1916 remained the same as before; that is to say, measures for the destruction of mosquito larvæ were applied in certain selected areas in which a sufficient bulk of the inhabitants had agreed to grant access to their houses and gardens for the purpose of dealing with any breeding grounds existing therein, and to pay the small voluntary tax imposed for the purpose of defraying the expenses.

The optional character, however, of the acceptance of the application of measures renders these of limited utility, as the occurrence of a comparatively few untreated houses and grounds in any treated area may be sufficient to provide a supply of mosquitoes such as will infect the whole area.

As regards this, there seems to be a very general misconception on the part of the public as to the possibilities of remedying a pest of mosquitoes. Frequent applications are received for the treatment of individual houses, or even single flats, in untreated localities.

It might be expected to be more generally recognized that, as far as any obvious effect was likely to result from such a limited application of measures, it would serve no practical purpose to initiate these, but it would seem, on the contrary, to be the general expectation that a total disappearance of all mosquitoes in any place, and under any circumstances, is the natural corollary of the payment of the small tax and the signature of the permit of entry.

To the logical acceptors of this creed the obvious inference to be made from any persistence of mosquitoes is that such a condition could only be due to some neglect on the part of the person responsible for carrying out the measures of larval destruction, with the result that every new extension of the work serves to provide an additional source of complaint.

It would be of considerable advantage, therefore, if it were more clearly understood that no public health authority can possibly eliminate mosquitoes from any locality under such conditions, and that the most that can be expected is that the application of measures is likely to be followed by an

evident diminution in numbers of mosquitoes, provided that the area is sufficiently separated and does not contain an undue proportion of untreated houses.

No great improvement, however, is likely to occur until the onus of prevention of mosquito-breeding is legally placed upon the occupier, and the right of entry for inspection granted to the Public Health Authority.

The exceptionally high Nile of 1916, by enormously increasing the breeding areas, led to a serious plague of mosquitoes in that year. This occurred principally in the more suburban areas, in most of which there appeared enormous numbers of anopheles in addition to the stegomyia and culex usually found. This naturally proved a source of some anxiety in view of the presence of large bodies of troops, of which some were likely to have been recent arrivals from malaria-infected countries.

By arrangement with the Military Authorities, malarial sick were kept out of the anopheles-infected areas, whilst special observation was kept on the conditions of health of the residents of these areas with the object of obtaining early information of any malarial infection.

A few cases actually did occur, but the number of these was very small, and with the fall of the Nile and the disappearance of the anopheles the danger ceased to exist for the time being.

It is to be remembered, however, that such a situation may return again, and though the conditions which arose were unusual and resulted from a Nile flood of exceptional height, the possibility of a repeated annual sequence of high floods, leading to a return of similar conditions in a series of years, might result in a grave malarial infection of the localities concerned.

APPENDIX.

Notes on the Unidentified Fever of 1915.

As has already been described, the year 1915 was marked by the occurrence in a grave epidemic form of a fever presenting such clinical contradictions as to render inadvisable the adoption of any nomenclature which might tend to indicate a possibly erroneous appreciation of its characters. Under the circumstances, therefore, it was decided to adopt throughout this report the unsuggestive term given above for the purpose of distinguishing the disease, and to put on record a short description of the characteristic points observed during the epidemic. This has been largely based on the notes made on those 1,547 cases treated in the Government Fever Hospital, and is supported by the facts observed in the Kafr el 'Elwa and El Ma'sara cordons.

The disease in its most typical form presented itself as a fever of variable duration, characterized by clinical manifestations strongly suggestive of typhoid fever, but giving negative results to laboratory tests for the latter disease.

Incubation Period.—This could not be determined with any accuracy, as no definite conclusions could be justifiably based on the indifferent histories supplied by the patients and their friends. Experimentally, in monkeys, it was found to vary from four to eighteen days, but, as will be subsequently indicated, these results are open to certain criticisms, attaching to all the experiments on monkeys carried out in connection with this epidemic.

Transmission.—The disease was of a highly-infectious character, with a high attack rate amongst those in close association with the sick, and spread rapidly in the localities in which it broke out.

The actual method of conveyance of the infection was not, however, determined.

Mode of Onset.—In the majority of the cases the onset of the disease was gradual, with a history of *malaise* for several days before the patient took to bed or even, in some cases, ceased his work. A certain number of cases, however, gave a history of sudden onset of illness attributed frequently by the patient to the effects of the sun. Of the cases treated in hospital, 78 per cent. give a history of a gradual onset, whilst 22 per cent. stated that the disease had commenced suddenly.

General Symptoms.—The most prominent early symptoms were headache and fever. In no case was any clear history given of an invasion marked by rigors or vomiting. The mental condition was quite clear, and even with temperatures of 40° C. the patients were inclined to sit up in bed and talked brightly. General body pains, aching in limbs, or abdominal pains were occasionally complained of. Backache was more rarely noted. The eyes were bright and clear, or showed various degrees of injection, though never very intense, or were watery. The pupils were unaltered. There was no coryza or complaints of sore throat, though the latter occasionally showed marked dryness of its mucous membrane. The tongue was in the majority of cases quite early covered with a thick white fur. The pulse was full and bounding. Various skin rashes were observed in a certain proportion of the cases.

As the disease progressed the patient became content to remain lying, though the mental condition usually remained clear, except in some very bad cases, when delirium and restlessness were noted. In the great majority of cases severe headache was the symptom most complained of. Most commonly no rash appeared, but occasionally petechiæ of the limbs and trunk were to be seen, whilst in a few cases roseolous body rash was noted.

The duration of the disease was variable, being only seven days in some cases, whilst in others it lasted several weeks. Most of the cases varied from nineteen to twenty-four days. In the majority of the cases the fever terminated by lysis, but the condition of the patient did not always improve with the cessation of the fever, an asthenic condition with dry tongue and feeble pulse frequently

persisting for many days after the defervescence. Relapses were not infrequent, though but few relapsed twice.

Fatal results occurred in 22·38 per cent. of the cases. In those, hyperpyrexia, with gradually increasing coma and heart failure, usually occurred.

Tongue.—This, in about two-thirds of the cases observed, was moist and covered with a thick white fur. In the remaining cases the tongue was found dry and red, or covered with a brown fur. In such cases, the dirty condition frequently was inclined to persist even after the fall of the temperature.

Digestive System.—As a general rule the appetite was bad, gastric pain was occasionally complained of, whilst nausea and vomiting occurred in some of the cases. Pain in the lower part of the abdomen, with intestinal gurgling, was almost always present. Diarrhœa occurred in only about a tenth of the cases, but never to any troublesome extent. In the remainder the functions of the bowels were usually regular, though showing occasionally a tendency towards constipation. The spleen was enlarged in about 40 per cent. of the cases, varying from a condition of being just palpable under the ribs to that of extending to about two finger-breadths beyond the costal margin. The liver showed signs of enlargement in about 5 per cent. of the cases. Abdominal pain at times seemed chiefly centred in the splenic region. The abdomen was usually full and tympanitic, with acute tenderness in those cases which complained of abdominal pain.

Circulatory System.—The pulse was invariably fast, and occasionally showed a tendency to be dicrotic, or irregular and intermittent. Associated with the rapid heart action, accentuation of the second sound was occasionally met with, whilst hæmic murmurs were to be noted in some cases. Blood taken for examination showed a marked tendency to rapid coagulation.

Respiratory System.—No special manifestations of the disease occurred in connection with the respiratory system, but signs of pulmonary congestion, or of mild bronchitis, were not infrequently to be detected, whilst definite patches of pneumonia were occasionally met with as complications.

Nervous System.—The most marked nervous symptom was the persistent and severe headache usually complained of. In the majority of the cases this was very pronounced.

The mental condition was generally good, though stupor and prostration were at times to be met with. In some cases delirium occurred, mostly of the muttering variety, with diminution of the acuteness of vision; there was one case of actual amaurosis. Stammering speech, *subsultus tendinum*, and tremors were occasionally seen. In fatal cases, coma for a day or two usually preceded the death. Varying degrees of deafness were noted in a large number of the cases. The deafness and tremors at times persisted for several days or even weeks after recovery. No cases of otorrhœa were encountered. No hiccough, muscular rigidity, or alteration of the knee jerks were noted. Incontinence of urine and fæces at times occurred. Aching of the limbs was not infrequently complained of as the fever abated.

Urinary System.—No symptoms of any special interest affecting the urinary system were noted. A few cases of slight fever albuminuria were seen, whilst cystitis and retention of urine were met with in a few cases.

Cutaneous Appearances.—In 72·0 per cent. of the cases no indication whatever of any rash occurred.

In 27·9 per cent. in which signs of skin change were observed, it presented itself in the form of a cutaneous mottling or of a roseolous or petechial rash. In the earlier stages of the epidemic the petechial rashes sometimes developed into large subcuticular hæmorrhages. No eruption, however, typical of the disease, could be said to occur.

Temperature.—In the relatively few cases which came under observation at the commencement of the illness the temperature chart invariably showed a gradual rise.

That this was the usual mode of onset is borne out by the histories of the majority of the cases admitted in the later stages of the disease, whilst in none of the cases seen sufficiently early to permit of conclusions being derived from the progress of the case were any indications of other than a gradual invasion. As against this, however, are definite histories of sudden onset in almost a fifth of the cases. These, however, rest solely on the statements of the patients or their friends, and are to be discounted to some extent by the possibility in some of these cases that the less obtrusive initial symptoms of the disease have been masked by the racial tendency towards a symptomatic insensibility. Such histories may possibly in some cases, therefore, indicate more a sudden obtrusion of the fact of illness than an actual sudden onset.

In the majority of cases the temperature dropped gradually to normal, the disease terminating by lysis in 77·2 per cent. of the cases which recovered. In 22·8 per cent. the fever ended by crisis.

In the cases terminating by lysis the period of defervescence varied from two to nine days, or even longer, and was frequently accompanied by profuse sweating.

The mode of onset bore no relation to the manner in which defervescence took place.

Relapses.—Relapses, at intervals after the defervescence, varying from three to ten days, were not infrequent. Thus, of the 1,546 cases treated in hospital, 146, or 9·4 per cent. relapsed. This percentage, however, does not exactly express the probabilities of relapse in this disease. Of the 1,546 cases, 346 died, of which only six occurred during relapse. From the total 1,546, therefore, there should be deducted 340 cases from which death had removed the potentialities of relapse. Calculated, therefore, on the remainder of 1,206 cases exposed to the chances of relapse, the 146 which actually occurred gives a percentage of 12·1 as a truer expression of probability.

Colonial Medical Reports.—No. 111.—Cairo (*continued*).

The relapses varied considerably, being in some cases exactly similar to the original attacks in their duration and severity, whilst in other cases the second attack was markedly milder and of shorter duration. Second relapses were rare. They only occurred in seven of the hospital cases. Of these seven, two of the cases relapsed a third time.

Mortality.—There were 346 deaths in hospital from the 1,546 cases admitted. The percentage of deaths was, therefore, 22·38. The European deaths were thirteen out of a total of twenty-eight cases admitted, giving a hospital case mortality for Europeans of 46·42 per cent. The number of Egyptian admissions was 1,518, of which 333 died, giving a percentage of 21·93 as the Egyptian case mortality.

Judged by this, the occurrence of the disease would seem to give rise to the least risk to life between the ages of 11 and 20 for both sexes, the mortality being lowest in the group 11 to 15 years in the case of the male, and in that of 16 to 20 years in the case of the female. Above this, each group shows a gradually increasing case mortality, which is high for both sexes in patients over 40 years of age. The case mortality amongst young children is below the average rate. It is highest as regards those in the youngest group of zero to 5 years, and gradually diminishes to the ages of least case mortality.

In these hospital cases the female case mortality is somewhat lower than the male.

Duration.—Independently of relapses, the disease was of variable duration, though as a rule it lasted about three weeks. Occasionally, milder cases, with a duration of as little as seven days, were met with, whilst cases which dragged on considerably beyond the usual three weeks were not uncommon, many cases of protracted fever with slow lysis lasting for five or six weeks.

Complications.—The complications most generally met with were pulmonary and bronchial abnormalities, which in mild forms constituted not infrequent concomitants of the disease. The most common of these was bronchitis, but broncho-pneumonia was not infrequent. Parotitis, phlebitis, gangrene of both lower extremities, laryngitis, epididymitis, nephritis, insanity, and abortion were all met with.

Diagnosis.—The distinction of the disease from typhoid fever was mostly based on laboratory tests consisting in the negative Widal reaction and the absence of typhoid bacilli from the blood, urine, and stools in the disease under consideration, though clinically the marked prominence of the headache in this disease raised suspicions of its nature.

The mental condition, the absence of the characteristic smell, the full abdomen associated with acute tenderness and pain, the general absence of any characteristic rash, the tendency usually to a prolonged lysis, and the frequency of relapses served to differentiate this disease from typhus fever.

Experimental Investigations.—For the reasons already given in the report, the experimental investigations into the nature of the disease were somewhat handicapped by the circumstances obtaining at the time of the occurrence of the epidemic, and by the difficulties attending post-mortem examination in this country. In the few cases, however, in which limited autopsies were possible, no appearances were found throwing any light on the nature of the disease, though in this connection it must be remembered that no very extensive examinations could be carried out, as circumstances only permitted of a somewhat unsatisfactory inspection of the abdominal organs in these cases through a small incision made in the abdominal wall. This, however, was sufficient to show the absence, at least in the cases examined, of any pathological condition of the intestine beyond an occasional slight congestion.

Numerous attempts were made during the course of the epidemic to isolate a causal organism, and efforts were directed towards obtaining cultures of such, on various media, under both aerobic and anaerobic conditions, but without success.

No organism was isolated from either the blood, urine, or fæces, or from splenic smears from a few fatal cases in which a partial post-mortem was permissible, which justifiably could be considered the causal agent. The negative Widal results were naturally based on a series of trials in each case, made at different periods, both during the course of the illness and after the defervescence, and not on single attempts.

Owing to circumstances resulting from the war, monkeys were not obtainable for experimental purposes in the initial stages and during the height of the epidemic. Later, a few animals were received and inoculated with blood from patients suffering from the disease. All developed an illness clinically indistinguishable from that which would have been produced in monkeys by the inoculation of typhus blood. On this alone, however, it would be unjustifiable to presume identity with typhus, as the clinical features upon which was based the distinction in the human cases were not such as would clearly indicate themselves in a monkey.

One of the inoculated monkeys was kept and was subsequently inoculated with blood from the heart of a monkey suffering from typhus, and thirty days later with blood taken straight from a human case of typhus, without result. The same monkey was again tried this year with a large quantity of virulent blood taken from a fresh case of typhus, but no disease developed.

The few inoculation experiments, therefore, which it was possible to make would seem to suggest a suspicion of the identity of the disease with typhus. As opposed to this, however, it is to be remembered that monkeys only became available when typical cases of the human disease were not available. During the height of the epidemic the disease differentiated in this report showed itself in a form which enabled a distinction to be drawn between it and those cases which were obviously typhus. With the termination of the epidemic, however, as has been

already mentioned in the report, dropping cases of disease still continued to be diagnosed as cases of the unidentified fever, though such as were so diagnosed did not present any features which would have been likely to raise any suspicion that they were other than somewhat atypical cases of typhus, had not the previous epidemic tended to supply grounds for diagnostic suspicion. Moreover, the desire to obtain material for investigation was so inclined to prejudice the diagnosis that, though it is hut right that the results of these inoculation experiments should he put on record, they can scarcely be accepted as throwing any conclusive light on the nature of the epidemic. Unfortunately, no cases could be obtained, after monkeys became available, presenting the diagnostic distinction from typhus which would have been provided by a relapse, and, under the circumstances, it must be taken that there is not sufficient evidence to show that the material for investigation was not obtained from probably atypical cases of typhus instead of from the disease which it was desired to investigate.

In two cases attempts were made to transmit the disease through the agency of lice, and 245 lice from four patients considered to be suffering from this disease were fed on one monkey, and 350 from two other patients on another. These experiments were unsuccessful, but, in any case, they would have been open to the same criticisms as were attached to the inoculation experiments.

Whilst leaving the question open, therefore, I am inclined to the belief that the disease was truly the result of some new infection, probably introduced into this country through the agency of those troops of varied races, and of the most diverse origin, which were then being poured into this country, and to attribute the high infectivity shown by the disease to the absence of any racial insusceptibility such as would have existed had the disease been previously prevalent in this country.

Colonial Medical Reports.—No. 112.—Jamaica.

ANNUAL REPORT OF THE SUPERINTENDING MEDICAL OFFICER FOR THE YEAR ENDED MARCH 31, 1918.

ONE has once more to call attention to the large number of deaths which have not been medically certified, and attention has to be drawn to the possibility if not probability that had cheap medical attendance been available many of those who died might have had their lives saved. The number of persons who die in Jamaica without a medical certificate as to the cause of death is very great. Possibly the mileage charges may have something to do with this, also the large amount of unlicensed practice now reported as being carried on by dispensers and others.

The very large number of deaths of children under 1 year and 5 years is a bad feature.

During the past year the Child Saving League, for which £150 has been allowed on the estimates, has been doing a good work in Kingston.

One portion of the work consists of certain centres where small children are fed, and in connection with these is a crêche where children are left by their mothers during the daytime in charge of a nurse. The £150 voted hy the Legislative Council goes to paying two nurses.

The daily average of babies in the crêche since its start was eleven, and the highest number on any day has been twenty.

The nurses also visit at the homes of the children.

The attendances of children for feeding during the year at the centres have been 2,514, and the visits made by the nurses at their homes were 1,224.

YAWS.

From the reports sent in by the various district medical officers it is very evident that the above disease is extremely prevalent throughout the island, and it would appear that some of the district and acting medical officers have forgotten the existence of Law 23 of 1910, which was passed during Sir Sydney Olivier's tenure of office.

Section 5 gives a district medical officer the power of requiring:—

(1) Any person suffering from yaws to attend at a time and place.

(2) Any parent, guardian, or person in charge of a child suffering from yaws to attend with such child at a time and place.

Section 6 gives the district medical officer the power of requiring such person (*a*) to present himself for inspection and treatment; (*b*) to bring such child for inspection and treatment at such times and places as may appear necessary.

We thus have all the power necessary in order to enforce compulsory attendance and treatment, hut what is still required is the "finance" to cover the cost of what everyone admits is necessary, namely, "the compulsory and continuous treatment of yaws."

As soon as money is availahle and the Medical Department is allowed a free hand in the treatment of yaws, there should be no great difficulty in gradu-

RETURN OF DISEASES AND DEATHS IN 1917-1918 IN THE PUBLIC HOSPITAL, KINGSTON.

Jamaica.

GENERAL DISEASES.

	Admissions	Deaths	Total Cases Treated
Alcoholism	—	—	—
Anæmia	17	—	17
Anthrax	—	—	—
Beriberi	—	—	—
Bilharziosis	—	—	—
Blackwater Fever	—	—	—
Chicken-pox	—	—	—
Cholera	—	—	—
Choleraic Diarrhœa	—	—	—
Congenital Malformation	—	—	—
Debility	6	1	6
Delirium Tremens	—	—	—
Dengue	—	—	—
Diabetes Mellitus	—	—	—
Diabetes Insipidus	—	—	—
Diphtheria	—	—	—
Dysentery	22	4	22
Enteric Fever	267	47	267
Erysipelas	1	—	1
Febricula	—	—	—
Filariasis	—	—	—
Gonorrhœa	253	2	253
Gout	—	—	—
Hydrophobia	—	—	—
Influenza	46	—	46
Kala-Azar	—	—	—
Leprosy	1	—	1
(*a*) Nodular	—	—	—
(*b*) Anæsthetic	—	—	—
(*c*) Mixed	—	—	—
Malarial Fever—	—	—	—
(*a*) Intermittent	—	—	—
Quotidian	—	—	—
Tertian	250	18	250
Quartan	1	—	1
Irregular	—	—	—
Type undiagnosed	—	—	—
(*b*) Remittent	—	—	—
(*c*) Pernicious	—	—	—
(*d*) Malarial Cachexia	—	—	—
Malta Fever	—	—	—
Measles	53	—	53
Mumps	—	—	—
New Growths—			
Non-malignant	32	2	32
Malignant	33	5	33
Old Age	—	—	—
Other Diseases	402	81	402
Pellagra	11	2	11
Plague	—	—	—
Pyæmia	—	—	—
Rachitis	—	—	—
Rheumatic Fever	—	—	—
Rheumatism	52	1	52
Rheumatoid Arthritis	—	—	—
Scarlet Fever	—	—	—
Scurvy	—	—	—
Septicæmia	10	9	10
Sleeping Sickness	—	—	—
Sloughing Phagedæna	—	—	—
Small-pox	—	—	—
Syphilis	—	—	—
(*a*) Primary	76	—	76
(*b*) Secondary	31	—	31
(*c*) Tertiary	49	5	49
(*d*) Congenital	12	5	12
Tetanus	8	3	8
Trypanosoma Fever	—	—	—
Tubercle—	—	—	—
(*a*) Phthisis Pulmonalis	—	—	—
(*b*) Tuberculosis of Glands	—	—	—
(*c*) Lupus	—	—	—
GENERAL DISEASES—*continued.*			
(*d*) Tabes Mesenterica	—	—	—
(*e*) Tuberculous Disease of Bones	—	—	—
Other Tubercular Diseases	—	—	—
Varicella	—	—	—
Whooping-cough	1	—	1
Yaws	—	—	—
Yellow Fever	—	—	—

LOCAL DISEASES.

	Admissions	Deaths	Total Cases Treated
Diseases of the—			
Cellular Tissue	105	—	105
Circulatory System	88	26	88
(*a*) Valvular Disease of Heart	—	—	—
(*b*) Other Diseases	—	—	—
Digestive System—	457	58	457
(*a*) Diarrhœa	—	—	—
(*b*) Hill Diarrhœa	—	—	—
(*c*) Hepatitis	—	—	—
Congestion of Liver	—	—	—
(*d*) Abscess of Liver	—	—	—
(*e*) Tropical Liver	—	—	—
(*f*) Jaundice, Catarrhal	2	—	2
(*g*) Cirrhosis of Liver	—	—	—
(*h*) Acute Yellow Atrophy	—	—	—
(*i*) Sprue	—	—	—
(*j*) Other Diseases	—	—	—
Ear	4	—	4
Eye	88	—	88
Generative System—	—	—	—
Male Organs	82	1	82
Female Organs	148	—	148
Lymphatic System	93	1	93
Mental Diseases	6	—	6
Nervous System	191	33	191
Nose	4	—	4
Organs of Locomotion	128	1	128
Respiratory System	106	9	106
Skin—	182	—	182
(*a*) Scabies	—	—	—
(*b*) Ringworm	—	—	—
(*c*) Tinea Imbricata	—	—	—
(*d*) Favus	—	—	—
(*e*) Eczema	—	—	—
(*f*) Other Diseases	—	—	—
Urinary System	142	53	142
Injuries, General, Local—	146	6	146
(*a*) Sirisasis (Heatstroke)	—	—	—
(*b*) Sunstroke (Heat Prostration)	—	—	—
(*c*) Other Injuries	—	—	—
Parasites—	60	2	60
Ascaris lumbricoides	—	—	—
Oxyuris vermicularis	—	—	—
Dochmius duodenalis, or Ankylostoma duodenale	—	—	—
Filaria medinensis (Guinea-worm)	—	—	—
Tape-worm	—	—	—
Poisons—	12	5	12
Snake-bites	—	—	—
Corrosive Acids	—	—	—
Metallic Poisons	—	—	—
Vegetable Alkaloids	—	—	—
Nature Unknown	—	—	—
Other Poisons	—	—	—
Surgical Operations—	—	—	—
Amputations, Major	25	2	25
,, Minor	606	—	606
Other Operations	563	8	563
Eye	34	—	34
(*a*) Cataract	—	—	—
(*b*) Iridectomy	—	—	—
(*c*) Other Eye Operations	—	—	—

ally abolishing it and making it a thing of the past, just as is small-pox.

Until finance will allow of that the disease must continue to spread, as every case uncured in a district is a "focus" of infection, leading perhaps to many new infections, or to use a Biblical expression, "A little leaven leaveneth the whole."

Venereal Diseases.

It gives me much pleasure to record the fact that, after urging the necessity for some long time past for the passing a law dealing with and providing for the control of these very serious diseases, it became my pleasant duty to introduce to the Legislative Council a venereal diseases law, which was based on the recent English law and the Grenada law.

The points that one wishes to impress upon the public and upon those who are suffering from venereal disease are: that

(1) One should try and prevent infection continuing from the earliest moment of infection if possible; while

(2) Neglect of early and efficient treatment make subsequent treatment more difficult, protracted, and consequently more expensive.

(3) Economically it is sound to spend money on efficient and early treatment, and so save later on expenditure on the treatment of chronic cases that have been neglected in the early stages of the disease, and which so often lead to social wreckage and do so much towards filling our hospitals, poor-houses, and lunatic asylums.

The necessity for treatment from the earliest moment of infection is obvious. It may here be mentioned that the Federal Government of Australia has decided to spend something like £25,000 a year for furthering facilities for diagnosis—it being estimated that full 16 per cent. of those in receipt of pensions have become invalids through the effects of inherited or acquired syphilis.

Hitherto the trouble in the treatment of venereal disease has been that patients will insist on considering themselves "cured" as soon as any inconvenience that may he felt or the external manifestations of whichever form of the disease that they may be infected with have disappeared, and after that the disease is neglected, only, in many cases, to appear later on in other and worse forms, the patients being in a position to spread the disease without being aware of the fact.

The new law provides for compulsory and continuous treatment, and for a penalty for non-compliance with the orders of the medical officer under whose care they are.

From the reports of the medical officers one gathers—

(1) That unless conpulsion is enforced no possibility of keeping venereal disease within bounds can be hoped for.

That the peasantry and labouring classes regard these diseases as "very simple ailments," which are of small importance, and in the case of the male population as being more or less a manifestation of manhood.

That cases of these diseases are commonly never seen by medical practitioners until far advanced, or until complications have occurred at a period when treatment is not likely to be so satisfactory or cure so rapid as would have been the case had the patient been taken in hand at an early stage.

One point in the treatment of venereal disease must be borne in mind, and it is this: that unless one is able to finance the "continuous" treatment of venereal disease the law must remain a dead letter; by financing the treatment I mean continuous and not spasmodic treatment.

Yaws still remain rampant on account of the absence of sufficient funds to carry on a "continuous" campaign against it, and the same will happen in the case of venereal disease unless the wherewithal is provided.

General Sanitation.

It is evident that very little in the way of new sanitary works has been accomplished by the various local boards, presumahly due to the lack of money and the high cost of materials. This of course is to be regretted, hut it is very evident that "one cannot make bricks without straw."

With regard to the introduction of an efficient latrine system in the various towns and villages of the island, one has to record the fact that very little has been done in this matter, and that the latrine systems of the towns and villages are generally unsatisfactory, and it is to be hoped that as soon as the International Health Board starts work in connection with hookworm, the various local boards will enforce the provision of efficient and antihookworm latrines throughout the parishes.

In spite of enforcing the installation of latrines on premises people, it is said, will retain their old customs and use the bush.

That may be the case for a time, but after a number of prosecutions have taken place people will learn to do what is right, and if in the schools children are instructed in cleanly habits, it will he found that the rising generation will soon learn to use latrines, and will not be satisfied unless they have them, and the hookworm pest will become a thing of the past.

Port Maria has installed a bucket system, and it will be noted that whereas typhoid fever was at one time prevalent in that village, it has now practically disappeared.

The question of the unsatisfactory condition of the latrine system of the island raises the question of the necessity for having a superintending sanitary inspector.

As at present there is no one to see that the various sanitary hoards are carrying out the law, it is absolutely necessary, if improvement is to be made, that a superintending inspector should be appointed who will take the law into his own hands, and see that both the law and the by-laws are enforced.

Regarding water supplies, it may be said that the freedom from yellow fever of the towns and villages on the coast is due principally to the number of water supplies now existing in those towns and villages, and to the comparative absence of the cistern and water barrel that used to be so much in evidence.

Colonial Medical Reports.—No. 112.—Jamaica (*contd*).

The subject of a water supply for Stony Hill has been discussed and estimated for *ad nauseam*, and up to the present no result has been arrived at in the matter, although the industrial school, containing some hundreds of boys and girls, has during one summer at least had to send to the Wagwater river in order to get its water.

Cleanliness is next to godliness, and so long as the boys in this institution have to carry water on their heads from place to place no thorough instruction in cleanliness can be carried out.

The water in the reformatory wells has been condemned by the pathologist on many occasions, and in the interest of health a proper water supply should be installed, as typhoid has also been prevalent at times.

Water being a necessity, everything possible should be done to provide supplies that are above suspicion, and that at the same time are plentiful and which furnish water adequate to the calls made on them.

HOOKWORM.

During the month of February, 1918, Dr. H. H. Howard, Director of the Rockefeller International Health Board, in the West Indies, arrived in Jamaica, and arrangements were suggested in accordance with which that foundation should commence work in Jamaica, operations being started by the making of a survey.

The selection of a district in which a commencement will be made is naturally left to the International Health Board although it would seem advisable that the work should commence in a district where one can be sure of the willing and effective co-operation of the estate owners.

Jamaica's part is the introduction of proper sanitary improvements in the shape of a satisfactory "latrine system," and to pay for the medicines and stationery. The Rockefeller International Health Board will carry out the treatment and will provide its own staff.

Dr. Howard laid great stress on the fact that he wishes the sanitary work and the distinctly medical work to be carried out by different officers and to be entirely separate—as it might imperil the success of all attempts at treatment were the public to associate the carrying out of the health law and its sequence of possible notices and prosecutions with the treatment of the disease. In other words treatment of and investigation of disease should be run separately from the enforcement of sanitary legislation.

Dr. Howard has urged that the International Health Board should deal with the government of the island only and not with the several local boards of health. This apparently is the custom in every place where the International Health Board carried on operations.

Dr. Howard told me the following fact, which is of interest :—

He stated that while going through a reformatory, somewhere in the West Indies, the manager or superintendent of the institution informed him that prædial larceny used to be very common among the boys admitted thereto, and that he used to have thirty or thirty-five at one time undergoing punishment for this form of theft, but that since regular and systematic treatment had been given the boys for hookworm infection the number of boys at one time under punishment for prædial larceny had decreased to five or six at a time.

The question would therefore arise: "How much, if anything, has hookworm infection in children to do with prædial larceny?" We know that some of those who are suffering from hookworm infection or disease owing to perverted sense become dirt eaters—may they not also become prædial thieves. Possibly the systematic treatment of hookworm infection may also reduce the amount of prædial larceny among children, just in the same way that a dirt eater when cured of hookworm drops his unnatural habit and regains his natural instincts. This island is fortunate in having obtained the services of the International Health Board, as I understand that when once a colony or country has refused or has not accepted the board's assistance when offered, as Jamaica has done, the said board goes elsewhere to help public health.

Port Antonio, *June* 17, 1918.

Copy of letter sent to the Superintending Medical Officer, Kingston.

"SIR,—Hookworm and its treatment is now very prominent in the minds of the profession and public, so I beg leave to give my experience to correct a fallacy which has always existed as to thymol.

"It is stated in most works and papers written on thymol treatment that thymol given with oil or followed by oil will exhibit marked toxic effects. This is not so, as the records of this hospital can show.

"Dr. Moseley finding thymol easily soluble in castor oil and very convenient for administration has for years given 20-gr. doses in this way, every third morning, and I have for the past year followed on these lines, with good results, and absolutely no ill effects. Very recently a child of 7 years who was badly infected took 28 gr., divided in three doses, in twelve hours with no ill effects except the usual depression which follows heavy doses, and with marked benefit to this condition.

"I am, &c.

"(Sgd.) FRED G. GROSSETT, Actg. D.M.G."

(The above would seem to show that thymol may be given as medicine in oil without any serious after effects.—ED.).

Malaria.

In so far as the hospital service is concerned malaria shows a smaller return than during the previous year.

The returns from hospitals depend very much upon the incidence of malaria among East Indians and are as a rule especially high in those hospitals to which East Indians chiefly resort.

What the actual prevalence of malaria may be

among the general public who do not live near a hospital it would be difficult to say, malaria not being a notifiable disease.

One of the best results achieved in the matter of the prevention of mosquito life is the gradual filling up of Warner's pond at Port Maria.

It would be well were it possible now to devote more money to the filling in of swamps and thus abolish a preventable disease that effects to a very great extent the working power of the labouring classes.

There are several swamps down the Rochfort Road in the parish of Kingston, which should be filled up, as that portion between Rochfort Road and the seashore, if freed of swamps and mosquitoes should become a most pleasant residential quarter.

Cheap labour could always be supplied by prison labour, and the work would be done quickly, there being no insuperable obstacles in the way.

Quinine is still being sold at the post offices at the original price of one farthing a 5-gr. dose or a penny for four doses; the Department is naturally a great loser financially, the difference in the price of quinine before the war and at present being 21s. 6d. the pound.

It was thought better, however, not to raise the price of these packets of quinine as the public are now accustomed to the prices charged and any interference with recognized charges made might interfere with the sale of the drug.

Isolation Blocks.

As mentioned on previous occasions some of the hospitals are very hard pressed for space in which they could isolate infective cases requiring isolation, in fact such space can hardly be said to exist in certain hospitals.

Ackee Poisoning.

During the past year a large number of cases of ackee poisoning have occurred in various parishes, whereas there are also parishes in which the trouble does not seem to occur.

The ackee appears to have been mentioned in times gone by in songs by the peasantry. One song has a verse as follows:—

> Carry me ackee go a Linstead market
> Not a quatty worth sell.
> Carry me ackee go a Linstead market
> Not a quatty worth sell.
> Lawd! not a light, not a bite,
> Not a quatty worth sell.
> Lawd! not a light, not a bite
> What a Saturday night!

Another song however (many of the verses of which I am told are unsuitable for publication) mentions the ackee in the words below—showing distinctly that even the poisonous nature of the ackee has been recognized and has been commemorated in song or folk lore of this island.

> Then you tek ackee bwile soup?
> Tek natta (i.e. annatto) colour it?
> Gal, you want fe come kill me, kill me,
> Gal, you want fe come kill me.

In view of this song which would appear to bear out Dr. Scott's theory that the ackee under certain conditions is poisonous, a theory that he has proved by pathological work, it would seem proper now to cease using the term "vomiting sickness," a name given to the ailment some years back due to ignorance as to its cause.

When vomiting occurs in the course of a disease it simply does so as a symptom and nothing more—one might even call billiousness with vomiting by the name vomiting sickness. The term does not exist in the nomenclature of diseases.

Now that the ackee has been shown to be, under certain conditions, poisonous, one must take care that this poison is not systematically used by evil disposed persons in order to rid themselves of other persons that they wish to get rid of.

Curiously enough the ackee (*Blighia sapida*) also exists in West Africa in the Lagos country under the name of "isin" and in the Journal of Tropical Medicine dated April 15, 1918, No. 8, vol. xxi, there is a report by Dr. A. Connal, Director of the Medical Research Institute, Lagos, and Mr. W. Ralston, Government Chemist, Nigeria, on some experiments that were made by them on animals, using the various portions of the "isin" (ackee) with a view to finding out whether that fruit was poisonous or not and which portion was poisonous.

The results are interesting for they corroborate Dr. Scott's investigations, inasmuch as the animals that died after being fed with extract of unripe ackees showed the same post-mortem appearances as Dr. Scott has found to be the case in Jamaica, fatty degeneration of the liver cells being very noticeable.

Further than that it is evident that the inhabitants of that region are quite aware of the poisonous nature of the ackee because these investigators quote a local Yoruba saying which is as follows "He who knows to eat the 'isin' knows to remove the poison."

It seems curious that in spite of much discussion from time to time in the local newspapers on the part of "amateur experts" on the subject of the non-poisonous properties of ackees that the folklore of two Colonies should have already settled the matter in one case (Jamaica) in a song and in another case (Nigeria) in a "saying."

The above-mentioned investigators also state that there is no trade in the fruit and that very occasionally a basket of "isin" is seen exposed for sale in the various markets, but that for all practical purposes it may be accepted that the fruit is eaten only by those who collect it themselves from an easily accessible tree and that further it appears to be the general custom to eat the "arrilli," discarding husk, seeds and "placenta."

It will now be necessary to have the school children in the elementary schools taught to distinguish by name the various parts of the fruit and which fruit to select for consumption and how to cook it, and what to consume and what not to consume when once the ackee has been cooked.

Annual Report on the work carried out in the Government Bacteriological Laboratory, April, 1917—March, 1918.

Pathological Laboratory, Public Hospital,
Kingston, Jamaica.

Two important matters have been made the subjects of special research, namely, the acute outbreak of central neuritis in Spanish town and its neighbourhood, and secondly, fresh investigations into the outbreak of "vomiting sickness" so-called.

Enteric fever has been more rife this year than last, and the increase is not due to any spasmodic outbreak but to a continued increase in cases throughout the year. If the old dictum that the incidence of typhoid is to be regarded on the sanitary index of a district holds good, the moral is clear, and the matter should be very seriously taken in hand before the return of the contingent with the necessary introduction of several more carriers to act as foci for the spread of the disease.

Fæcal Examinations for the Presence of Helminthiasis.

The examinations were made primarily for the detection of ankylostomiasis, but incidentally other worms or their ova were looked for at the same time. Owing to many medical men being away the treatment has probably not been so carefully or so thoroughly carried out, for there has been no fresh immigration of coolies during the year, nevertheless the percentage of infection has risen considerably.

During the twelve months under review 4,073 specimens have been examined for this purpose. Of these 3,497 contained ova of some worm or other —Ankylostoma, Ascaris or Trichuris. This gives a percentage infection of 85·85 as compared with 80·79 during the preceding year.

Taking account of the country districts only, that is excluding Kingston itself, and those who are apparently healthy and who merely have to be examined to obtain a certificate to enable them to emigrate to the United States, out of 3,362 specimens examined from the various parts of the island only 150 have been free from all helminth infections, giving a positive percentage of 95·54. No benefit would arise from going into the details of the Ascaris and Trichuris infections.

Other fæcal examinations were carried out for deciding as to the presence of the amœbæ of dysentery, and some also for the isolation of the *B. typhosus* and *paratyphosus* in suspected carriers; 665 such have been examined.

Many of these examinations have been in connection with some research work which was started in October. This, however, had to be abandoned temporarily when the outbreak of vomiting sickness arose and I received orders to investigate this last matter over again. I hope to be able to continue this during the present year.

On the subject of dysentery, without going into the figures in detail, it will suffice to say that cases giving positive results are becoming more numerous; in part, at least, this is due to more patients being examined and the gradual elimination of the idea that amœbic dysentery did not exist in Jamaica. Many of the contingent who have gone to the front will certainly return infected with the amœbæ. Some have already returned and possibly have contributed in part to the increase. Under the present sanitary, or insanitary, condition which many of the class of men from which the contingents have been recruited, pass their lives, this fact will constitute an even more serious menace to the community than does enteric fever at the present time.

Other examinations have been carried out for the isolation of enteric bacilli from the stools of suspected carriers and of those who leave the hospital after passing through an outbreak of the disease, as already mentioned.

A few specimens have also been sent up for examination for occult blood in cases of suspected duodenal ulcer or malignant disease.

Wassermann Reactions.—During the year April, 1916—March, 1917, there were 202 sera submitted to this test. During the first six months of the succeeding year now under review 146 were tested and facilities for free examination having been given subsequently to this the number sent up for the second half year has been considerably increased, viz., to 248, giving a total for the year of 394, almost twice that of the previous twelve months.

As regards this test I have found it necessary here to go through the whole process of standardizing the hæmolysin and the antigen each time, as well as the complement. At home it is a common practice to make an original test of the first two and then check them occasionally. Here, however, the variations are so marked that the preliminary standardizations have to be performed on every occasion. This is laborious, necessitating five hours' work each time before the test proper can he started, but the increased trouble means far greater accuracy and is consequently well worth while.

Among specimens of sputa sent up for examination for the presence of *B. tuberculosis* it is interesting to note that there were three cases of bronchomycosis and one of streptothorix infection. One of the former apparently cleared up completely, that is to say, all physical signs of active mischief disappeared, the health improved and the patient was able to be discharged from hospital and return to work, and there was no sputum for some time prior to leaving hospital. Of the other two, one died in two to three months after coming under observation, with extension involving the pleura.

Special Matters arising from Routine Examinations.

(A) *Relative to Enteric Fever.*—(1) A localized enteric fever outbreak on board a vessel.

A certain vessel put into Kingston Harbour with several of the crew ill, and I was ordered by the Central Board of Health to visit the ship and see the patients with a view to elucidating the nature of the complaint. I found six of the crew ill, four of them seriously. The other two had only reported sick within the previous forty-eight to seventy-two hours.

The vessel had come from an insanitary port and in view of the febrile nature of the complaint and that four had palpable spleens and some abdominal tenderness I took specimens of the blood from these patients to test by the Widal reaction for typhoid or paratyphoid fever (none of them had been vaccinated for either of these conditions) and smears for malaria.

The results of the examinations were :—

(i) Chief Officer H. had been ill about ten days; he showed some suspicious rose spots and had had headache for the first week or so but not severe. His blood gave a well marked agglutination reaction with *B. typhosus* and in low dilution with *B. paratyphosus* A also (this proved to be merely a group reaction). No malarial parasites seen in the smear and no increase in the large mononuclear cells, none of those seen contained any pigment; there was a relative lymphocytosis.

(ii) Chief Officer S. This patient's serum gave the same reactions as the last, and it was rather curious they were both taken ill on the same day, June 19th. The smears from this patient showed the presence of the *Plasmodium falciparum*.

(iii) (a steward) : This man had reported sick "off and on for a week or so" feeling ill one day and a little better the next and going on with his duties, but somewhat lethargically apparently. His blood gave a strong agglutination with *B. typhosus*, none with either of the paratyphosus organisms and his blood also contained malarial parasites.

(iv) N.A.B. This man was very weak and looked more seriously ill than any of the others, but was walking about in a partially dazed condition. He had been ill, it appeared, some twelve days. During the morning of the 29th he had fallen down "through weakness." His blood also gave a good agglutination with *B. typhosus* and a few plasmodia were seen in the smear of his blood.

(v) E.S.: another of the crew. This man had only been ill for two, possibly three, days. He was up and about and complained only of headache and sleeplessness. Smears of his blood were taken for examination for malarial parasites and in case he had been ill really longer than he stated a Wright's pipette of blood was also taken on the off chance that an agglutination reaction might be obtained. His temperature when I saw him was just upon 100° F. No parasites were seen in the smears, but the Widal test gave a positive reaction with *B. paratyphosus* A, no agglutination with *B. typhosus* at this stage at least.

(vi) The blood from another man was taken as smears for malaria. As he had been well until the same day (29th) no specimen was taken for a Widal reaction. No malarial parasites were found in his blood.

They were all six landed and taken to the hospital, and except the last who rapidly got well, they all passed through a typical attack of enteric fever.

In view of this outbreak and hearing that the first two were taken ill the same day, I took samples of the water supply for analysis and it proved to be remarkably pure. I also obtained specimens of the urine and fæces of several, asking specially for those of the cook and stewards, and in fact any who took part in the preparation or handling the food.

Briefly stated, I was fortunate in finding that the assistant cook was a carrier and was excreting typhoid bacilli.

(2) A girl, aged 9, suffered from an attack of enteric fever; Widal gave well marked agglutination on December 27, 1916. She passed through an attack of average severity. Early in March, 1917, when the child had been convalescent for three to four weeks, her mother began to suffer with acute attacks of trigeminal neuralgia of the right side with photophobia at the onset. Prior to this the mother had always been quite healthy, in fact she did not remember ever having been ill in her life. The neuralgia lasted with great intensity for three days, practically without intermission and unaffected by the administration of gelsemium, croton, chloral, morphia, &c. During the ensuing four or five days there was a certain degree of alleviation, but a dull headache remained. While the attack was on and also afterwards there was marked cutaneous hyperæsthesia. In the second attack the occipital area of the same side became affected. There followed another interval of comparative comfort for five or six days and another attack came on. The temperature was variable; it was occasionally 99° F. and once rose to 102° F., but was mostly subnormal. On April 9, in view of the illness of the child, whom she nursed, and in view of her rise of temperature and the intractability of the neuralgia, her blood was examined, and the serum gave a marked agglutination of *B. typhosus*. She was constipated, had no abdominal pain, possibly a slight enlargement of the spleen, but no other sign of typhoid fever, in fact no symptoms except the neuralgia. She vomited occasionally when the pain was at its worst.

On suspicion of there being antrum or dental affection, the practitioner called in the aid of a dentist. but treatment of the teeth did not give any relief, Since the second attack she had complained of a "brow ache" on the left side. On or about April 15 she began to see double any objects more than 10 in. distant, and on examination there was seen to be a very slight internal strabismus of the right eye. In view of the occasional vomiting, marked frontal headache, and the signs of infranuclear affection of the right sixth cranial nerve, a tentative diagnosis of cerebral tumour was made; the discs were difficult to examine as the patient was very intolerant of opthalmoscopic examination, and no optic neuritis was made out. Another possibility suggested was typhoid or post-typhoid neuritis, affecting the fifth and sixth cranial nerves.

Specimens of the urine and fæces were asked for, for bacterial examination, and the *B. typhosus* was isolated from the latter. In the course of time, fully another month, all the symptoms cleared up, the photophobia, the neuralgia and the strabismus, so the condition was in all probability a typhoid neuritis.

The question as to whether the child had infected the mother, or whether the mother was a chronic carrier and had infected her child could not be determined.

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(3) Lastly, it may be noted that in a former report of three years ago, an account was given of outbreaks of enteric fever occurring yearly at the reformatory, some fifteen to twenty cases arising each year. No carrier could be discovered among the inmates or workers there. It was decided therefore to inoculate all the inmates as a prophylactic measure. This has been most successful; the Medical Officer in charge tells me that for two years there has been no case among the inoculated; only one case occurred this year, and that was a new arrival who had not received the vaccine.

(B) *Vaccine Treatment.*—A case representing very fortunate results of vaccine treatment also deserves a brief record.

A girl, aged 18, suffered with dental trouble for a considerable period and for two years had had a chronic discharging sinus in the left upper alveolus. Scraping had been tried repeatedly, but the condition remained unrelieved, the sinus being too tortuous to clear properly. As a last resource the patient was sent up with a view to having an autogenous vaccine made. This was done, and after the second injection there was considerable improvement, and in three weeks the discharge was very slight. The patient did not come for further treatment for a month, thinking all was well, but the discharge was then becoming more free, so she had a further course of injections. The condition soon cleared up altogether, and there has been no sign of any recurrence.

(C) *Post-mortem.*—Lastly under this group mention must be made of three post-mortem cases which presented features of special interest.

(1) A case of fatal laceration of the lung without any external marks of violence pointing to any pulmonary mischief. That the lungs may sustain serious injury from a blow, a fall, compression and so forth, although no external marks of violence are visible is a well known fact; nevertheless definite instances of such are still sufficiently rare to warrant the following being placed on record.

So far as I can ascertain from the literature at my disposal the concrete cases are few and none of them quite correspond with the one related below.

The subject was a man L. R., aged 25, strongly built and of good physique. He was walking in the street and talking to a friend about 8.5 to 8.10 p.m. on June 28, 1917, when they heard the sound of a motor car close behind them, and bearing down upon them. They jumped one on each side; the friend who was on the right succeeded in getting out of the way, but the other was struck on the right side by the car and fell. It is uncertain whether the lamp or mudguard came into actual contact, but the witnesses of the accident were unanimous in stating that no part of the car passed over the patient's body. He was picked up insensible and driven in the car to the hospital which is less than quarter of a mile from the scene of the accident. He arrived at 8.20 p.m. and was found to be dead.

Superficial examination then showed wounds of the left side of the head, but no bleeding from the ears or mouth.

At the post-mortem carried out at 10 a.m. the next day, the following conditions were found: With the exception of the head injuries described below, there were no marks externally of any violence or injury. No long bones (including the ribs) were fractured, and there were no signs of any contusions or even abrasions anywhere on the body, back or front.

Head.—(i) A wound extending to the bone, 8 cm. in length, curving outward from the left malar eminence to just above the left eyebrow; the malar bone was fissured. (ii) From the middle of this was a lacerated wound involving the outer half of the upper eyelid; the eye itself was not injured. (iii) Extending from the root to the nose, a wound 3 cm. in length passing upwards and outwards to the right; this was separated by a narrow bridge of skin from (iv) a triangular wound of the inner canthus of the left eye as if cut by the point of a stone. (v) A small lacerated stellate wound of the left parietal eminence down to the pericranium. From this site a fissured fracture passed through the occiput to the base, and there was a small subdural blood-clot beneath the parietal eminence. The left orbital plate of the frontal bone was also fissured.

The brain showed no hæmorrhage whatever, and there was no laceration of its substance.

On opening the thorax the right pleural cavity was found to contain about 1¼ litres of blood. This was removed and careful examination again made for any fractured ribs; all, however, were intact and there was no sign of any contusion of chest wall internally or externally.

The lung was then raised to the surface and a tear was found in the lower lobe vertical in direction, some 6 cm. long but not deep. The middle lobe was intact, but the upper lobe just above the line of separation from the middle lobe showed a piece of the lung tissue 7 by 5 by 4 cm. almost completely severed; it was hanging by a mere thread of lung tissue and attached visceral pleura. The lungs were everywhere perfectly healthy, as were also all the other viscera, thoracic and abdominal. There were no pleural adhesions. The head injuries were not very severe, and the rapid death was due to the laceration of the lung and hæmorrhage. The head injuries are easily explained by the effects of the blow on the right side throwing him to the ground, and the left side of the head coming into contact with stones in the road.

I cannot explain the mechanics of the lung condition. The man was certainly not run over, all the witnesses swore to that fact, and the deceased was a strongly built adult and the ribs were not very yielding and elastic like those of the child mentioned in the case previously cited, yet there was no fracture or even contusion visible; nor was there any obvious manner in which counter-pressure could be applied; lastly, the lung condition was not a mere superficial tear, nor a separation at the root, but an almost complete severance of a piece of lung tissue of considerable size at the periphery of the organ.

(2) A case of extensive wounds of the throat, larynx and trachea self-inflicted.

The suicide carried out his object in front of a crowd of people, but as it has been stated that one severe injury of the trachea precludes the person from inflicting a second on himself (in fact this has been used as an argument in favour of homicide as against suicide), I think this case worthy of record, for if it had been perpetrated in the night or when no one was about to witness the act, it is more than likely that some unfortunate person might have been indicted for murder.

C. E. M., male, aged 25, admitted to hospital at 5.55 p.m. on May 31, with an extensive cut throat wound. He died ten minutes later. At the post-mortem the only signs of violence were those in the neck and were as follows: (i) A long wound (probably made up of three or more) gaping and with jagged edges extending from the middle of one sternomastoid muscle to the other. (ii) Small wound through thyro-hyoid membrane, horizontal. (iii) Vertical cut 2 cm. long through upper part of right side of the thyroid cartilage. (iv) Incised wound 7 cm. long passing to the right from the lower part of the left thyroid across the middle line extending right through. (v) Incised wound severing thyroid from cricoid and detaching lower part of right thyroid from the body of the cartilage. Deep vessels of neck not severed.

Left lung contained blood in the bronchi extending down from the severed windpipe; and trachea contained blood and frothy-bloodstained mucus. Right lung somewhat less affected, though in similar condition. Right pleura adherent at apex, and the lung beneath was infiltrated with tubercular disease over an area the size of a fives' hall. Finger tips and nails of right hand showed dried blood. Nothing else noticeable.

Comment is needless except to say that had not the deed been perpetrated in front of several witnesses one could hardly have credited that such extensive injuries could have been self-inflicted.

(3) A case revealing very clearly the connection between the so-called vomiting sickness and ackee poisoning: A.S., male, aged 3. Between the hours of 3 and 4 p.m. (August 9) he was seen to be eating ackee; shortly after this vomiting started and continued repeatedly till be was brought to the hospital at 8 p.m. When seen at 8.5 p.m. he was still vomiting, the vomitus consisting of mucus and yellowish undigested food. The pulse was low and the extremities were cold. Temperature 98° F. The stomach was washed out and stimulants freely administered. He improved greatly to all appearances, but at 1.30 a.m. (10th) vomiting and retching returned, coma rapidly supervened, the Cheyne-Stokes type of perspiration was noticed and the child died at 2.30 a.m. No convulsions were reported.

At the autopsy on August 10 the body was found to be that of an exceptionally well-nourished child.

Stomach.—The mucous membrane of the stomach was congested especially towards the cardiac region, The organ itself was practically empty, there being merely a little mucus and a few minute yellow masses. Duodenum and upper part of the intestines had similar contents (ackee fragments).

Peyer's patches were prominent and mesenteric glands slightly enlarged and pinkish in colour.

Liver.—Was of a purple red colour over a considerable part of the surface; in other parts and on section of these congested areas the tissue was seen to be very yellow and fatty, almost the colour of cornmeal.

Pieces of the following tissues were taken in alcohol and also in Fleming: liver, kidney, spleen, pancreas, heart muscle. All the tissues showed the changes which have been described in detail in the monograph on the vomiting sickness. This is a valuable case in that the symptoms were typical of the "vomiting sickness," as were also the post-mortem findings, both naked eye and microscopical, and the child had actually been seen eating the fruit shortly before the onset of the illness.

Special Investigation.

(1) An acute outbreak of "central neuritis" at Spanish town.

A brief mention was made at the end of my last annual report of a peculiar epidemic which was occurring in the Spanish Town district. The condition was given the title tentatively of the Spanish Town epidemic because the disease was first notified from this place hy Dr. C. Redwood White, and the majority of cases occurred there. It must be distinctly understood, however, that subsequent inquiries have shown that the condition is also met with elsewhere and moreover there is a considerable weight of evidence to support the thesis that the "Spanish Town epidemic" represents the acute stage or an acute onset of the disease, which, when it has become chronic, has for a long time been designated in Jamaica as peripheral neuritis.

General History.—Nearly all the patients are adults. Of a large number of cases seen there were but three children, and they were far from typical in the symptoms they exhibited. The youngest patient coming under my observation was a girl of 14 years of age. All of those attacked during the epidemic were of the peasant class, that is, natives who worked as lahourers on the sugar estates or who in rare instances had small holdings of their own. Males and females were equally affected. The epidemic started during the cutting and carrying of the cane crop, and the reporting of fresh cases ceased almost ahruptly as soon as the crop was finished.

The following is a brief general description of the main features of the condition; differences shown by individual cases will be noticed in the detailed account of such.

In practically every instance the first symptom complained of was a sensation of "itching in the eyes." This would come on with comparative suddenness while the patient was at his usual work. In some cases both eyes would be attacked about the same time, in others one eye would he affected alone at first, and after an interval of varied length from a few (three to four) hours to as many days similar

sensations would be felt in the other eye. At this early stage the conjunctiva would be congested and there would be photophobia, but not of much intensity. Within the next three days or so the conjunctiva, both ocular and palpebral, would be in a swollen, red, œdematous condition, the edges of the lids would show abrasions, and small superficial ulcers would form with discharge of pus.

Within four days to a week of the onset of the eye symptoms, a burning sensation in the mouth is complained of. This is referred to the mucous membrane of the lips and cheeks, but not the tongue. The lining membrane becomes red and inflamed and aphthæ make their appearance, especially along the edges of the mucous membrane of the lips. At the angles of the mouth a small ulcer or fissure is often present. Salivation is not a common feature. I noticed it only once in the twenty-one cases detailed, and did not observe it in any of more than 100 other patients seen at the hospital.

The soreness of the mouth gives rise to pain on eating for the first twenty-four hours or so; after that, in spite of the congestion and ulceration, food is taken without any difficulty or complaint. This soreness is by the patients themselves often attributed to eating sugarcane.

The affection of the eyes was usually treated by yellow oxide of mercury ointment and the conjunctivitis cleared up fairly readily. For the stomatitis a mouth-wash containing chlorate of potash and boric acid soon gave relief.

The above was the sequence of events at the onset in almost every case. One patient stated that the mouth was affected before the eyes, but this was the only exception.

No further symptoms develop during the succeeding week or so, in other words till about fourteen days after the first onset with itching sensations in the eyes. After this interval, however, further symptoms declare themselves and the cases naturally relegate themselves to one or two categories.

(1) Those with *diarrhœa and intestinal symptoms.*—These patients have loose actions increasing in frequency to as many as twenty-five in the day. Of those so affected, some die in a few days apparently from exhaustion, others slowly recover. No treatment seems to benefit the diarrhœa, which appears rather to cease gradually and spontaneously in those who recover. In the latter no further symptoms occur and recovery seems to be complete. The stools are watery and brown in colour.

(2) *Those with nervous symptoms.*—These patients are invariably constipated. As far as I myself observed, and from the histories of a large number of cases reported to me by the medical officer in charge of the hospital, in all of those exhibiting nervous symptoms constipation was the rule, and as a corollary to this, in none of the cases belonging to the preceding class (intestinal cases) did any nervous symptoms develop.

The following gives a general résumé of the progress of nervous cases.

The patient states that he feels a sensation of numbness and tingling starting in the toes and soles of the feet, occasionally accompanied by a feeling of heat and burning. The numb sensation slowly extends over the dorsum and up the legs to the knees —in some patients to the hips. Both limbs are affected together and the spread is equal in both; in other words the legs appear to be affected segmentally, symmetrically, and simultaneously.

Some patients state that they feel "pain in the knees," but this is only complained of when movement of the joint is carried out. Palpation is quite painless, and there is no heat, redness, or swelling, in fact no objective sign of any joint trouble. With the spread of the numbness walking begins to be impeded, and in the course of three or four days, when the condition has extended to the knees, walking is impossible. The patient can no longer stand unless supported, there is marked inco-ordination, and the patient has practically no control over the lower limbs. When supported and assisted in getting out of bed, the legs are thrown about with wild, exaggerated movements. In some cases, in the intermediate stages, between the "delicate," unsafe gait of early numbness and the later total inability to walk, the gait is suggestive of that of tabes. Also at this stage there is no real loss of power, the knee-jerks and other deep reflexes are quite abolished, Babinski's sign gives no response normally in a native owing to the horny thickness of the soles caused by their walking barefoot. Sense of position is not always, or even often, defective, although spontaneous disposition of the limbs is no longer possible.

In spite of the general complaint of numbness over so large an area, no alteration of sensation could, as a rule, be detected objectively. With the eyes bandaged, the responses to finger-touch, to cotton wool, pin-head, and pin-point were correctly estimated and localized

The differentiation between heat and cold even with a fairly wide difference of temperature was frequently defective. Although no change of sensation, at least no recognizable blunting of the sense of touch, was observable objectively, I noticed more than once in those who were still able to walk that one or both slippers might come off the feet and yet the patient would continue his progress down the ward without them, or with one off and one on, and not notice the loss until he happened to look down and discover that he had left one slipper behind, when he would return for it.

The difficulty of walking was not made worse by closing the eyes, nor again did the patients watch their feet to help their progress.

Some cases remain in this condition, but in others a similar sensation of numbness is complained of after a further interval of one to four days or more, and, in a few, the backs of the hands, the forearms and occasionally the upper arms are affected also.

In the worst cases there was some difficulty of speech, due, as the patients described it, to numbness of the tongue. No numbness of the face was mentioned by any of the patients. No alteration of sensation could be detected in upper limbs or tongue by objective tests.

In those cases which terminated fatally after a considerable period (four to six weeks or more), there was marked general emaciation; no localized wasting of muscles could be detected at any time. The reaction of degeneration was not found in any instance, though in some there appeared to be a slight alteration in the nature of a less brisk response than normal, but nothing very tangible could be made out.

Some of the patients with nerve symptoms complained during the early stages of "pain in the stomach," and described it "as if someone was pulling a rope tight round the chest." It was clearly the nature of a girdle pain, and only occurred in the second group of patients—those with nervous symptoms, not in any of those with diarrhœa and intestinal symptoms. This pain was not aggravated by food, in fact the patients ate well without any discomfort.

The last stage of the fatal nervous cases was always the same. About forty-eight to seventy-two hours before death, when the patients were lying helpless in bed, diarrhœa would set in, and the exhaustion from the combined inanition, emaciation and diarrhœa soon brought about the fatal issue. Even towards the last, though the patient lay helpless, and to all appearances totally paralysed, nevertheless there was not in reality a condition of paralysis, all movements could be performed, though feebly on account of the emaciation and general state of exhaustion.

A large number of examinations, both clinical and pathological, were carried out in connection with these cases. Over 100 patients must have been seen and examined clinically, but twenty-one were fully investigated. Specimens from these took six months to complete from the examination point of view. Blood examinations were made, both total and differential counts, serum reactions by the Wassermann test, the excreta were tested and cultivated, eye, mouth and throat cultures carried out, and from those who died parts of the various tissues were subjected to examination in detail.

The so-called Vomiting Sickness of Jamaica.

When the third hurricane in three successive years struck this island in September last and destroyed a large proportion of the natural foodstuffs, one predicted that the outbreak of the so-called "vomiting sickness" would probably be both severe and widespread in the succeeding cooler months. This prophecy has been only too amply fulfilled. With a view of minimizing the disastrous effects of this disease placards were printed and distributed all over the island warning the people of the dangers and notifying them of the precautions which they should take to mitigate the ravages of this epidemic. Since, however, many, in fact the majority, of the inhabitants were still sceptical of the fact that vomiting sickness and ackee poisoning were synonymous terms, His Excellency the Governor issued instructions that I should visit the various districts in which cases occurred, and carry out fresh investigations into the condition.

It is gratifying to be able to state that the fresh investigations have absolutely confirmed the results of my former work.

The outbreak this year has been exceptionally severe, as the following record of cases proves, but whereas in former years the mortality has been exceedingly high (between 80 per cent. and 90 per cent.) in this last outbreak, although the number of persons attacked has been far higher, the mortality rate has been very greatly reduced. This can only be attributed to the propaganda issued in the shape of the pamphlets and notices spoken of above.

When carrying out my investigations this year it was quite a common occurrence to find that though several members of a family might be attacked, only one, perhaps none, might die, the prompt treatment and precautions recommended having led to the recovery of the other members, and thus to the saving of many lives. At a rough estimate obtained by making inquiries when one was investigating a case, it would be safe to say that the mortality rate, in spite of the great incidence, is more in the neighbourhood of 30 per cent. than 90 per cent., in other words, some 250 to 300 lives at least have been saved. Though this is a matter for congratulation, it is not enough. My investigations this year, as already stated, and as the records given in the sequel prove, have shown that, putting out of the category of diseases which have been hitherto returned as "vomiting sickness" those which are well known, such as cerebral malaria, meningitis, gastritis, and so forth, by far the largest proportion of the residue are cases of ackee poisoning.

The ackee, the fruit of the *Blighia sapida*, is an excellent food, and quite harmless when used with caution and when properly prepared, but when improperly gathered, when carelessly prepared, when eaten in an immature state, it is a deadly poison, probably one of the most deadly known.

To get this fact to penetrate is uphill work. The natives and Europeans also have been accustomed to eat this fruit for many years. The latter are exceeding cautious in the gathering and preparation of it, and will rarely eat it unless plucked from trees in their own gardens and under their personal supervision, and consequently cases of poisoning amongst them are rare. The native, however, is not so careful; consequently he and his are the greater sufferers. As soon as the people generally can be made to understand the conditions under which the food can be eaten with impunity, and to follow out the precautions necessitated by these conditions, ackee poisoning cases will become less and less, and may even be abolished altogether, and the dread vomiting sickness be a thing of the past, and hundreds of lives saved which are now needlessly, one might almost say wantonly, thrown away. The difficulty is this. The fruit has been eaten for many years, and these mysterious sudden deaths have occurred year after year, but the two things have never been connected until one's investigation and experimental work of 1915 onwards had the fortunate results of elucidating the matter.

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These deaths were and even are now attributed to worms, to cold (in the tropics), to starvation (although the majority are well nourished), to duppies and evil spirits and to obeah. This last is not an imaginary danger, for the poison almost certainly belongs to the toxalbumin or phyto-albumose (phytotoxin) group in common with cirin, crotin, ahrin and robin for which no distinctive test is known, and may he used for purposes of homicide with little risk of detection.

These points, however, are side-issues; what one would impress upon the people is that if the precautions recommended were conscientiously carried out, vomiting sickness and ackee poisoning would disappear from the record of causes of death, and hundreds of lives would be saved. Even this year with a large incidence of cases the reduction of the mortality by some 50 per cent. is gratifying in showing that one's efforts have not been altogether fruitless and gives ground for the hope that further propagandist efforts may lead to total eradication of the disease in epidemic form.

I would like to acknowledge the help which has been afforded me in this last investigation by the various medical officers who took the trouble to make personal inquiries as to the histories of the cases, particularly Drs. Campbell, Purchas and Watson in Trelawny; Dr. Dryden in Clarendon; Dr. Wilson in St. Ann's; Dr. Gideon in Portland and Dr. Crooks in St. Andrew.

Direct questioning of parents in nearly every case is met at first with a flat denial of the use of the food at the meal preceding the illness. The reasons for this are three :—

(1) The child may have picked the immature fruit and eaten it without the parents' knowledge.

(2) The use of the term "ackee poisoning." When the police make the preliminary inquiries before an autopsy is ordered, the native is afraid that he will get into trouble either for not looking after the children carefully, or on the graver charge of "poisoning" the children.

(3) They fear that, if it is acknowledged, the trees may be cut down and they will thus he deprived of a useful and palatable food.

The denial is valueless. In many instances at the post-mortem examination ackees are found in the stomach. In this connection the following extract from a letter sent to me by a district medical officer is of interest. . . . "I may mention that in the past there have been several instances at post-mortem in which ackee has been found by me in the alimentary tract, but out of several only in one case did the relatives admit that the child ate the ackees. . . ."

If the vomiting has removed these, confirmation of the suspicion is often found by examination of the kitchen, where ackees ripe and unripe, and husks of those which have been recently used, are seen. Many examples of this are afforded by the brief histories given in the fuller report. Fortunately although there is no known chemical test for proving the presence of the poisons of this class in the tissues, the microscopical changes are so very marked and characteristic that they are unmistakable. These changes need not be given in detail here, they have been described in my former reports and monograph on this subject.

However, the response to my request was almost universally acceded to; in the majority of cases the post-mortems were ordered and specimens sent. I regret to say that in one district in the island where cases are rare, burial was ordered and post-mortem examination refused, but this is almost the only place where full investigation was negatived.

Two or three points only need be especially insisted upon. The most important of these is the fact that of all the cases which have been reported to me as vomiting sickness in this epidemic, there was one case of fish poisoning, terminating in recovery, one of ptomaine from fish in which, however, ackee was a part cause of death; two of gastritis, both recovering; one fatal case of scarlatinal nephritis; seven of malignant malaria, only one of which recovered, and one in which death was due to ackee during the course of a malignant attack, and one from gastro-intestinal trouhles associated with dentition. Therefore of the 172 cases all but fourteen were cases of ackee poisoning, and in two out of these fourteen ackees took part, although not being solely responsible for the symptoms; in other words in the recent epidemic, out of 172 cases which were brought personally to my knowledge as "vomiting sickness" no less than 158, or 91·86 per cent. were instances of ackee poisoning.

This in a nutshell is the final corroboration of my discoveries of 1915, the proof of what I put forward then merely as a theory that vomiting sickness, the true vomiting sickness which was recorded as accounting for so many deaths each year, was nothing more nor less than ackee poisoning, the fruit of the *Blighia sapida* used in an unfit, immature condition for food. Experimental work carried out with extracts made from these constituted the proof and has been already recorded and need not be narrated again in the present report.

It is high time then that this reprehensihle term of vomiting sickness he expunged from the nomenclature of diseases in this island, for the labelling of a disease by the name of one symptom, which symptom even may he absent, hinders advancement and leads to carelessness in diagnosis. This state of things would be analogous to diagnosing "death from headache" when the patient may have suffered from the headache of typhoid fever, or that of cerchral tumour, or that of uræmia, and so forth, and disregarding the origin of the headache. Seeing that the macroscopical and still more the microscopical anatomy of the condition of ackee poisoning is so marked and distinctive there is no longer any excuse for not separating these cases from the large nondescript group of "vomiting sickness."

The poorer people may be excused for using the term just as they use the term "fever" for practically all conditions from malaria to stomach-ache, but there is little or no excuse for any medical man to

employ the term, since it is indicative of either (*a*) insufficient examination in not detecting abnormalities post-mortem, or (*b*) a false conception of what is meant by "diagnosis," in thinking that hy naming a symptom they diagnose the disease, or (*c*) want of interest in not inquiring properly into the history, or, where there is any doubt, in failing to send tissues to the laboratory where they can be examined and reported upon at no charge or trouble to themselves; and in my future reports should cases of ackee poisoning call for special mention they will be spoken of as such and not again as so-called "vomiting sickness."

Seeing that the facts are now definitely established, that the knowledge of them is gradually permeating through the people even to the most sceptical, such an epidemic as this last should never occur again.

I think, therefore, that this is a fitting place to give a brief summing up of the whole matter of the dread vomiting sickness, so-called, which had been the cause of hundreds, nay, thousands, of deaths in Jamaica during even the thirty-two years of which records have been kept. In some years there may have been only 100 or so, in others as many as 400 cases with a mortality of 80 per cent. to 90 per cent., so that by the moderate estimate of an average of 150 per annum, there will have been the loss of nearly 5,000 lives since the disease came into prominence in the records of 1886. How many occurred prior to that date is a matter of guess work only.

The duration from the first appearance of symptoms until death occurs may he very short; in one case, J. DeV., it was only half an hour, in another, E. W., it was an hour, and the average duration of all the cases in which this was ascertainable with accuracy works out at fifteen and a half hours.

Lastly: I beg to report that unless the people are wilfully careless, or wilfully ignorant, such an epidemic as this last should never occur again, and to form a fitting summary of the whole question I submit the following remarks which, taken in conjuction with my previous reports on tbe so-called vomiting sickness of Jamaica will enable any inquirer in the future to make himself cognizant of all the salient facts of the hitherto mysterious condition, clinical, pathological and experimental.

The separation of the toxic principle, the devising of chemical tests for identification of that principle are matters for the chemist and tbe physiological botanist, and are out of my domain.

For the purposes of this summary to avoid vain repetition the question will be dealt with under the headings of:—

(1) Prior to 1915.
(2) The investigations of 1915.
(3) Further points brought out hy the 1918 epidemic.

(1) Prior to 1915.

Briefly this period may be summed up as follows: The disease had existed for many years, particularly prevalent in the cooler months, November to March or April, and in each year it had been responsible for a considerable number of deaths, and in some years had exacted a terrible toll among children.

The earliest records which I have been able to trace date from thirty-two years ago, when the non-committal but descriptive name of "the vomiting sickness" was given to a condition which was beginning to command respect owing to its mysterious nature, its sudden onset, and its high mortality rate (80 to 90 per cent.).

Tracing the history of the disease from that time (1886) to the present has been an interesting study, but it must he passed over to enahle us to come to more important matters. Briefly, the period 1886 to 1915 may be summed up by saying that, during the season in which the disease was usually prevalent, any child that died after vomiting was diagnosed (by some practitioners) as having suffered from vomiting sickness while other medical men, rightly scorning so indefinite a term, erred in signing up true vomiting sickness cases as baving died from gastritis, yellow fever and so on; while yet a third group, fortunately a small one—on attending patients with some obscure condition terminating fatally would sign the certificate by the delightfully safe but paradoxical diagnosis, "vomiting sickness without vomiting."

In 1906 letters were sent to the other West Indian Islands asking wbether any such or similar disease was met with there and the replies all went to prove that the condition is practically limited to Jamaica.

So serious were the ravages of the disease that, in 1910, an expedition was sent out from England to investigate it, but without result, and again in 1912, a second expedition was made, which in turn went back bafiled.

(2) Investigations of 1915.

In February, 1915, a severe outbreak occurred on the north side of the island, and eighteen deaths took place in a small district in two days, and I was sent down to investigate the matter on the spot.

I had the good fortune to see a considerable number of cases, some almost from start to finish, and to perform autopsies on all who died during my stay in the district. I visited the huts where cases had occurred, and interviewed survivors and the relatives of those who had died. Briefly the symptoms of the condition are these:—

The patient—almost invariably a child—in apparently perfectly health, suddenly complains of feeling ill, and occasionally of pain in the stomach. This is usually mere discomfort and not, I believe, actual pain, but as the native tersely puts it, "him belly trouble him, doctor." He then vomits; perhaps only once, perhaps three or four times at short intervals. Recovery then seems to take place, and, if the attack occurs at night, the child drops off to sleep, apparently well again. Some three or four hours later, (occasionally after a longer interval) the child wakes up, again complains of feeling sick, and begins once more to vomit, usually frothy mucus, and later watery fluid only, or it may be bile-stained. There is little if any accompanying effort, unless the stomach be empty, when troublesome retching may ensue. Within a very short time, often a matter of a few minutes only, convulsions make their appearance, coma rapidly supervenes, and terminates in death.

Recovery from the first attack of vomiting being to

all appearances complete, a doctor is not usually summoned until the relapse occurs. The majority of patients, therefore, first come under observation during the convulsive or comatose stage. The temperature is usually normal or subnormal; the pulse is of good volume, and rate is 90 to 100 per minute: respiration 26 to 30, and regular until towards the end, when the Cheyne-Stokes rhythm may be noticed. The pupils are equally, moderately dilated, and, if the coma is not too deep, react to light. There is no delirium, and shortly before passing into the comatose stage, the child may remark that it feels very bad, but does not call attention to any particular symptoms or complain of any localized pain. There is no rigidity in the true vomiting sickness cases (except, of course, during a convulsion) but a general limpness of muscles; movement, such as turning the patient over for examination purposes or to obtain fluid by lumbar puncture, frequently leads to a repetition of the vomiting.

Such is the picture of the majority (80 to 90 per cent.) of such cases, for the mortality rate is very high. In the rare instances which recover the vomiting is practically the only symptom. I have never met with a recovery when once convulsions or coma has set in. Recovery when it occurs is very rapid. Within twenty-four hours or so, a child who had appeared to be seriously ill may be up and about, showing nothing but a little pallor and debility, as after any severe bout of vomiting, while others in the family, who did not seem any worse at the time, have passed into a state of coma and died in a few hours.

A few of the symptoms merit a little more detailed description:—

(1) *Vomiting.*—This may be, and usually is, the first objective symptom. The nature of the material vomited is usually at first food or if a considerable interval has elapsed since the last meal (and this is uncommon), frothy mucus, then watery matter, later bile-stained. At times the vomiting may be replaced by troublesome retching. Next, as regards the times at which vomiting occurs. In a typical case, vomiting takes place at the onset, and may be the very first symptom. It is usually accompanied by considerable effort and is repeated two or three times, at short intervals. This I have termed the "initial vomiting," and gives one distinctly the idea of an effort on the part of the stomach to rid itself of some noxious material.

After an interval of calm, during which there are practically no symptoms, there is a return of the vomiting, and now it is of a different character. It is, to a great extent, effortless, and may be unaccompanied by nausea. This I have designated the "secondary vomiting," and it is in my opinion, cerebral in origin, owing to its character of being effortless and induced by movement, and to its being followed almost at once by other nervous symptoms, twitchings, convulsions and coma.

Initial or secondary vomiting may be absent. Thus, as stated already, the former only is seen in cases which recover—in other words, the patients never reach the stage when the secondary cerebral symptoms appear. On the other hand, this "initial vomiting" may be suppressed in the very rapid and acute cases. There is an attack of vomiting which is so rapidly followed as to be almost accompanied by the convulsions and coma, the entire symptoms being cerebral, owing to rapid absorption of the toxin from an empty stomach. Death in these cases may occur in an hour, or even less. More rarely, the secondary attack of vomiting is suppressed; the patient may pass through the initial attack and appear to improve; then after a considerable but varying interval, he is seized with convulsions, passes into the comatose stage and dies.

Lastly, vomiting may be absent, and the cerebral symptoms may be the first indications of anything wrong. For example, I have among my notes the following case: A child, 4 years of age, was quite well when she ate her dinner at 1 p.m. Two hours later she felt out of sorts and went to lie down. An hour or so afterwards her mother went to waken her, but could only partially do so; twitchings of limbs and slight convulsions came on, and the child lost consciousness altogether and remained comatose till death.

Such cases have been diagnosed somewhat paradoxically as "vomiting sickness without vomiting," and I am sure that they do occur, though with exceeding rarity. Such a diagnosis, however, could not be made unless, firstly, true vomiting sickness cases were occurring at the time; secondly, all other causes could be excluded; or thirdly, the post-mortem signs, especially the microscopical were those of vomiting sickness.

(2) *Convulsions.*—These may vary from merely slight twitching movements of the limbs to definite massive convulsions. They may be tonic muscular contractions lasting for a few seconds only, or more clonic, and epileptoid in character. Looking over my notes in cases which recovered, slight twitching movements occurred in one patient only, a child of 4 years of age. We have all of us seen slight twitching movements in a child asleep, in ordinary health, or possibly with a little dyspeptic disorder. With reference to the vomiting sickness one may safely say that in no cases which recover are convulsions seen.

(3) *Coma.*—In most of the cases which I have seen this has been deep; as a rule, there was absolute unconsciousness with absent conjunctival reflex. In some, at an earlier stage of the coma, there was general flexion, and some irritability was exhibited when attempts were made to rouse the patient; but this "cerebral irritation stage" was transitory and soon passed into one of deep coma.

A few remarks may be added on the question of age, sex, and duration of illness. These all refer to the 1915 investigations with which this section deals and are corroborated in the essential features in the 1918 epidemic.

Age.—The condition is, to a great extent, one of childhood; sucklings are not attacked. I have records of only three cases under the age of 12 months, and these were not breast-fed. Nearly half the cases (44·84 per cent. of my series) occur in the first quinquennium, another 30 per cent. in the second and 85 per cent. of cases are under the ages of 15 years. The mortality rate is high in all these periods; thus,

of those under 5 years, 85·06 per cent. died; of those between 5 and 10 years, 86·21 per cent. died; and 84·24 per cent. of those attacked under 15 years succumbed.

Sex.—The affection shows no predilection for sex. Thus, in the first decade 45 per cent. of those attacked were males and 55 per cent. females; and the death-rate was closely similar, 46 per cent. and 54 per cent.; while in the third quinquennial period, of fifty-eight cases of which I have full notes, thirty were males and twenty-eight females: of these fifty terminated fatally, and this number was contributed to equally (twenty-five each) by males and females.

Duration of Illness.—In 140 instances I have been able to obtain reliable accounts of the duration of illness. The shortest recorded was in a female child, 1 year, death taking place in thirty-five minutes. The average duration of the total number works out at 12·72 hours. Sex has no influence on duration for although of those whose duration is given eighty-two were females and fifty-eight males, the length of illness from the time of onset to death—including, when present, the period of calm—works out at 12·5 hours in the case of males and 12·89 in females, a difference of only twenty-three minutes.

It will not be time wasted if I briefly recapitulate the symptoms by shortly describing four cases exhibiting the different types:—

(1) A mild case; a girl, aged 9, was given some "soup" from boiled ackees and bananas at noon. A 2 p.m. she complained of pain in the belly and vomited. The vomiting continued on and off for three hours. She was seen by a medical man, who gave her a mixture containing ether and ammonia. The vomiting ceased, and the child had quite recovered by the following evening.

(2) A male, aged 3, in normal health when he was given an evening meal of the soup made from bananas, yams and ackees. Two hours later, without any complaint of pain, he vomited. He rapidly recovered from this, and appeared quite well on being put to bed an hour or so later, and slept well till just before dawn. He then without any warning suddenly vomited again, was shortly afterwards seized with convulsions, and coma supervened, which lasted till death at 11 a.m. The total duration was sixteen hours; there was a symptomless intermission of eight to ten hours, and death occurred in five hours after the onset of the secondary vomiting. Here we have an example of a case apparently quite mild at first, but nevertheless terminating fatally.

(3) A girl, aged 6, after a similar meal, went to bed in her usual good health. Early in the morning, without any warning or previous complaint, she suddenly vomited, and did so three times in the course of an hour. During the day she stayed in the house and did not feel quite well, but took food. She seemed better in the evening, and slept well during the night. Early the following morning, without warning, again she started vomiting frothy watery material, without any effort. A few minutes later she was attacked by convulsions and passed into a state of coma, dying at 2 p.m. This case resembles the last, but differs in the longer duration of illness, and in the fact that the interval was one of improvement, not total abatement of symptoms.

(4) A girl, aged 12, left home in good health for school, three miles away. At midday she had a meal containing ackees, and returned to school, where nothing amiss was noticed, until three hours later she started to vomit; this occurred four times. Feeling better she started for home, but during the walk she felt ill again and vomited at intervals, taking three hours to make the three-mile journey. Shortly after arriving she became drowsy, this drowsiness deepened to coma, and she died about midnight without recovering consciousness. Here we have an example of a case in which convulsions were absent.

The changes set up are very widespread, and may be summarized as follows:—

Hyperæmia of most of the organs, including the meninges, with œdema or the supporting tissues; there is a tendency to hæmorrhages evidenced by small extravasations, e.g. in kidneys, adrenals, lymph glands, spleen, lung; the epithelium, particularly of the kidney tubules, the pancreas and liver, shows necrobiotic changes; and, lastly, and most important, is a marked fatty change in many organs, notably the liver, kidneys, sometimes in the cells of the pancreas and heart muscle, and the large Betz cells and others in the brain.

Of course, in a disease such as this, which becomes epidemic every year, bacteria have been suspected and carefully looked for, without result. In fact, during the course of my investigations of 1915 I stated "in my opinion the disease has no bacteriology. The organisms which have been found in some of the patients (a small percentage only) I can see no reason for regarding as in any way causative." The absence of prodromata, of any true incubation period, the serious and extensive lesions, the negative results of attempts frequently repeated at finding or isolating any organisms, all made me incline to the opinion that the condition was not a bacterial infection, but a pure intoxication, and the sequel bore out the surmise.

To sum up the thirty-two cases which came under my notice in this outbreak in the small district on the north side of the island: in seventeen the attack followed closely on the ingestion of ackees or a watery extract (soup or pot-water) made from them. In eight others there was a strong probability that ackees comprised one of the constituents of the meal prior to the onset of the illness. In these instances the parents had had a meal containing ackees and the children "may have had some." In the remaining seven cases no definite history of the food could be obtained; but I visited the huts in which the cases had occurred and noticed in every instance, without exception, that trees bearing ripe fruit were growing in the yards, and it is most unlikely, to say the least, that such a food, ready at their very doors, a food of which they all are fond, and which was then ripe, would be avoided, especially at a time when other articles of food are scarce or at least relatively expensive. In none of the thirty-two then could the eating of the fruit be definitely excluded.

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The next point was to make inquiries concerning the ackee, the fruit of *Blighia sapida*, which is used to a considerable extent as an article of diet in Jamaica. Amongst the better classes the ackees are gathered carefully, one by one, and not only those which are properly opened and appear ripe and sound in every way are taken for food. Unopened ackees are not used by such people, nor any which have not opened naturally on the tree or have been gathered from an uninjured branch; those forced open after falling from the tree unopened are dangerous. Among the poorer people, however, less care is taken, and a boy is sent up the tree to shake down the fruit; ripe and opened and unripe unopened fall together; the former is collected and the latter left. In time, some of these may open and be gathered with fresh ripe ackees brought down at the next shaking. This point is referred to again and in greater detail in the next section.

By the time the investigations into the Montego Bay outbreak and the examination of the various tissues taken post-mortem were nearing completion, I considered that sufficient evidence had been presented to warrant the bringing in of a true bill against the ackee, sufficient, that is, to put it on its trial, so experimental work was started with this end in view.

In order to simulate as closely as possible the conditions under which, by this hypothesis, cases of vomiting sickness occur, some ackees were obtained, which to all appearances were good except that they were unopened or had been forced open after being gathered immature. The part used for food was then boiled with water just as was done by the natives in making their soup or "pot-water." The product, practically a watery extract of ackee, was then filtered. The result is a liquid of the colour of weak tea with a layer of oily, fatty matter like melted butter floating on the surface.

The extract after administration by mouth to kittens or pups set up the following train of symptoms: Within an hour of administration of a small quantity vomiting set in, and the animal was inclined to be heavy and dull for about half to one hour. Recovery then took place and the animal became normal and lively again. The following day a slightly larger dose was given with similar results, recovery being apparently complete in two hours or a little more. After an interval of three hours a third dose was given twice the size of the first. Vomiting came on forty-five minutes later, and the animal became dull and drowsy, its head nodding as with sleep in some cases, in others it merely lay about and was disinclined to move and vomited at intervals. This drowsiness gradually deepened to coma during the succeeding hour, and death took place some four hours after the last administration. The total amount given was the extract from one ackee. The post-mortem appearances were, both naked eye and microscopically, absolutely typical of those found in human vomiting sickness patients. I repeated the experiment on several animals, merely varying the dosage, and except for a slight difference of interval between the feeding and the onset of the vomiting, according as the dose was small or a little larger, the symptoms and post-mortem appearances were the same.

Briefly stated, the characteristic symptoms of the so-called vomiting sickness appear an hour (more or less) after the administration of filtered watery extract of ackee. In human cases, where other food was taken as well and the action probably slower in consequence, the interval was usually two hours. After a small dose there was vomiting, and after a larger still, vomiting, drowsiness, coma and death. The matter had by this time progressed beyond the realm of mere hypothesis, and a most welcome confirmation came three months later, when the following cases occurred:—

On the evening of August 19, 1915, a family of eight, all at the time in good health, partook of a meal of ackees taken from a branch of a tree which had been damaged by the hurricane of the previous week. About two hours later, five of them complained of feeling sick; later three of these were attacked by vomiting, and one who had drunk some of the soup, shortly afterwards became convulsed, rapidly lost consciousness and died within twenty-four hours of the meal. The remainder completely recovered.

Six days afterwards, at 6 p.m., another similar meal was prepared. The soup together with some of the boiled ackees were eaten by a woman 24 years of age. At 8 p.m. she vomited and soon afterwards stated that she felt better; at 10 p.m., however, the vomiting returned, convulsions followed, coma set in and death took place shortly after midnight. Another member of the family was also taken ill, but recovered after vomiting. The autopsy I carried out myself and took specimens of practically every organ and tissue. Full details of both macroscopical and microscopical appearances have been given in the paper already spoken of.

Here then was a definite history of a patient previously in good health partaking of a meal of ackees from a bruised limb. She with other members of the family suffered from vomiting and recovered. A week later another meal was prepared with fruit from the same tree. The patient drank the soup and also ate some of the solid. Two hours later the symptoms appeared and ran their course to a fatal termination in six hours or so, and at the post-mortem the typical changes were revealed. In this case the term "vomiting sickness" was not used from first to last, but the case showed typically the onset, course, and pathological changes of that disease.

Certain peculiarities and characteristics of the affection which at the onset was most puzzling, then found a ready explanation in the light of our present knowledge of the similarity (identity) between vomiting sickness on the one hand, and the effects and results of experimental administration of ackee extract on the other, linked together by the clinical case of definite ackee poisoning just related. These were:—

(1) *The Peculiar Seasonal Prevalence.*—The epi-

demic character of the disease corresponds exactly with the main ackee season, when other fruits and natural foods are relatively scarce. If the ackee season lasts longer than the usual November-December to March-April, then also cases of vomiting sickness continue to be reported for similarly longer periods. Ackees are also obtainable in smaller quantities at other times, but other foods are then plentiful and this fruit is less eaten. Occasionally cases of vomiting sickness, however, appear at other times as the one just related. It used to be thought that it was a disease of which occasional, sporadic cases occurred during the warmer months, becoming epidemic in the cooler, comparable, for example, with cerebrospinal fever due to the meningococcus.

(2) *Limitation to Jamaica.*—The results of the circular letter sent to the authorities of the other West Indian Islands have already been mentioned. I myself have made inquiries of inhabitants of other islands and am told that the *Blighia sapida* does not grow to any extent in any of them. It is true that one or two trees are found, but they are looked upon as curiosities and are not used for food. They grow in British Guiana but are not used for food, nor in Cuba where the natives call it "vegetable brains" and never eat it; in Barbados they will not grow to maturity, being killed off by "scale" at the bush-stage.

(3) *Sudden onset of symptoms* in the midst of apparent good health, without any incubation period or prodromata, and in the well nourished and not necessarily the emaciated or debilitated. We see now that the symptoms, being those of an acute intoxication, would depend not so much on the general well-being of the subject as on the dose of the poison and the condition of the stomach, whether empty or full, and its consequent readiness for absorption.

(4) *The Rapid and Complete Recovery of Non-fatal Cases.*—This is obvious, and explained by the fact that an acute vegetable poison is taken; if the dose is small it is got rid of by the vomiting, and the patient recovers.

(5) *Affection of several persons practically simultaneously in one house,* or close neighbours in a settlement. Several members are affected in one house because the food is cooked together and shared in common. Close neighbours in a settlement are affected because the trees are in and about the settlement and all share in the produce.

(6) *The vastly greater Prevalence in Children.*—This is explained by the fact that they are given the "pot-water," the most toxic part—an extracted poison, in short—and that the lethal dose of a poison is far smaller for a child than for an adult; and also the adults know the risks of eating unopened ackees while children naturally do not.

(7) *Attacking the West Indian Native in much greater numbers than the East Indian or the White Man.*—In Jamaica the coolies live largely on rice and split peas, often in the form of curry; they also like green fruit—mangoes, guavas, jack-fruit. They rarely indeed eat ackees. A few after they have served their time and settled in Jamaica, may eat them, but not at all commonly. The white buys his ackees in the market, where he can see and select them; while, safer still, many will only eat ackees which have been carefully gathered under their own superintendence and from their own trees.

A few words may be added to explain the rationale of the precautions recommended.

The statement has been made that Europeans and the better class natives exercise considerable caution in picking the ackees, only those fruits which are fully open and mature are used, and even then as an additional precaution the fruit is boiled separately from the other ingredients and the water thrown away. As has been proved by experiments, the details of which I have already reported, the poison is extracted by boiling with water, and, therefore, if an immature (or poisonous) fruit is inadvertently used the poison is thus removed.

With the peasants the procedure is different. A boy is sent to shake the tree, and the fruit in all stages falls to the ground. Mature and opened and immature fruits are there together. The "fit" ones, that is the mature and opened fruits, are taken, the remainder being left on the ground. The children wandering about the yard, many of them hungry, pick up some of the immature fruits, force the husks open, and eat the fruit, and are poisoned.

Returning for a minute to the fruit left after removal of the opened and mature ones. Some will open soon by action of the sun's rays—such, not having opened naturally on the tree, are poisonous, analogous, one may say, to those forced open. Those which are "full" or mature will open naturally in a couple of days or so in the shade, and such, so far as my experimental work goes, are harmless. If they are not "full" they will not open within that time, and though apparently "full" are not "fit," and must not be used for food.

It is necessary to understand the use of the terms employed, as the significance is not the same as it would be at home. The word "ripe" is applied as a general term to indicate that the tree looks well, that the fruit is coming towards maturity, that the pods are red. A "ripe" tree does not mean that the fruit on it is ready for eating. The stages to that point are (1) ripe, (2) mature or full, (3) fit or opened; to these a fourth may be added: the fruit must consist of well-developed arilli. Each fruit contains three of these arilli, and although opened one or more may be deformed, with small and poorly developed seeds, such are sometimes at all events poisonous. If a branch has been partly broken or bruised by high winds, the fruit on it does not open naturally, and is poisonous. Fruits in the "full" stage are shipped abroad to Colon, and open naturally on or before arrival there, and are consequently harmless.

We can see from this description what should be the proper procedure to prevent ackee poisoning. When the tree is shaken and the fruit in various stages falls, the "fit" and opened pods should be picked up, and those alone used for the next meal, and only those with undeformed arilli; the mature and full ones should next be taken and placed to open away from

the direct sun's rays before they can be used with absolute safety, and any of these which do not so open in two or three days should be discarded; the immature, unopened pods should all be picked up and taken away, as they will never be fit for eating; in order that they may not be found by children and inadvertently eaten they ought to be burned. Boiling with water appears to remove the poison completely, or nearly so. The reason for boiling separately from other food is that if one with deformed fruit or if an immature fruit should happen to be used, from careless supervision, the water or "soup" then contains the poison, and should be thrown away. If other articles of diet, such as yam, rice, &c., are boiled with it, some of this water (with extracted poison) is absorbed by these articles, and may cause poisoning.

Amongst the poorer natives the soup is not thrown away, but is given to the younger children, who thus constitute a large percentage of cases, and the poison being taken avidly on an empty stomach is rapidly absorbed and rapidly kills. The poison is precipitated, or at all events appears to be rendered inert, by alcohol. Hence, if this is given at the very onset of the vomiting, before much has been absorbed, the poison is ejected at the succeeding attack of vomiting, and recovery rapidly ensues. Absorption, however, is very rapid, and if the administration of alcohol (rum, whisky, brandy, or as sp. ætheris and sp. ammon. aromat. of which the "vomiting sickness" medicine is composed) be delayed till the secondary symptoms appear, all chance of recovery is lost. Sometimes there is no interval between the vomiting and the secondary symptoms, "cerebral" vomiting, convulsions, and coma: in other words, absorption is so rapid that no primary local symptoms occur. The initial "gastric" vomiting is absent, and the first indications are the (usually) secondary "cerebral" symptoms. Such is not uncommonly the case where the "soup" is taken at the last meal of the day shortly before bed time. A few hours later the child wakes up and vomits, and before the mother can give any help or any medicine can be obtained, convulsions and coma have supervened, with the invariably fatal result.

Examples of each of these are amply supplied by the record of cases in this year's epidemic. One can only hope that the experience of this epidemic, dearly bought as it has been, will drive home for good and all the lesson that ackee poisoning is a preventable disease, and that if the precautions which have been drawn up as the outcome of these investigations are conscientiously carried out, the people will be able to use the food with safety, while epidemics of vomiting sickness and ackee poisoning will become things of the past. Then instead of the few hundreds of lives which have been saved this year hy those who followed the advice given and the precautions laid down, there would be thousands spared to grow to maturity —children whose lives are now needlessly, thoughtlessly, wantonly thrown away.

H. HAROLD SCOTT, Government Bacteriologist.

Colonial Medical Reports.—No. 113.—Shanghai.

ANNUAL REPORT OF THE MEDICAL OFFICER OF HEALTH, SHANGHAI, FOR THE YEAR 1918.

By ARTHUR STANLEY, M.D., B.S.Lond., D.P.H.

Health Officer.

THOUGH the public health was threatened in three different ways by extreme danger, the past year proved a healthy one. With the exception of a few cases of smallpox early in the year, due to the carelessness of new comers in regard to vaccination, and a limited number of fatalities from influenza pneumonia, the incidence of preventable disease was remarkably small.

Yet the year was an anxious one because of the urgent need of guarding against imminent dangers when the foreign healtb and nursing staff was depleted hy the fourth year of the war and working for the most part without the necessary period of rest away from China which long leave affords.

The salient feature of the record of the public health during 1918 is that of a series of shocks. The year opened with pneumonic plague again dramatically in the picture as a menace from the north. What is now known as the Shansi Epidemic, which killed some 15,000 people, made a tragic sweep from the Suiyuan District in Mongolia, just to the north of Shansi Province, through Pekin and down the Tientsin-Pukow Railway to Fengyang and Nanking, where it opened up dire possibilities among the populous and overcrowded centres in the lower part of the Yangtsze Valley. Immediately plague was reported in Fengyang, special preventive measures were formulated, and when Nanking was infected such steps as were possihle were taken to limit passenger traffic by rail and river from the infected areas, and in the Settlement itself for the discovery of cases and means of preventing further infection. However, in none of the places south of Shansi did the outbreak show signs of much momentum, and, after a small flare up in Nanking, it subsided with the coming of spring.

Another bolt from the hlue was the remarkable

METEOROLOGY OF SHANGHAI.

A very distinct earthquake was felt on February 13, but no material damage resulted in Shanghai, though in Soatow and other places in the south of China lives were lost.

		Jan.	Feb.	March	April	May	June	July	August	Sept.	October	Nov.	Dec.	Year 1918
Barometer	Mean inches	30·414	30·292	30·169	29·983	29·862	29·742	29 618	29·778	29·883	30·117	30·236	30·284	30·031
	Departure from average	+0·091	+0·017	+0·001	−0·021	−0·011	+0·012	−0·064	+0·060	−0·023	+0·012	−0·000	−0·026	+0·003
Temperature	Mean degree	31·97°	41·70°	46·46°	56·42°	65·42°	72·96°	79·00°	81·44°	72·97°	63·86°	52·24°	44·90°	59·16°
	Departure from average	−6·88	+2·32	+0·47	+0·26	−0·08	−0·44	−0·82	+1·20	−0·03	+0·48	−0·28	+2·90	+0·06
Daily range of temperature	Mean degree	22·74°	18·76°	17·80°	17·22°	20·02°	14·96°	15·89°	17·00°	19·18°	21·08°	15·82°	10·12°	17·46°
	Departure from average	+8·82	+4·78	+2·34	+0·68	+1·96	−0·58	+0·32	+1·12	+8·44	+8·62	−2·28	−6·24	+1·52
Degree of humidity	Mean (saturation—100)	63·8	76·8	79·6	81·8	75·9	85·0	84·5	81·9	78·8	77·6	82·4	84·2	79·4
	Departure from average	−15·3	−1·8	+0·6	+1·7	−3·7	+0·6	+0·03	−2·4	−4·3	−2·2	+4·5	+8·0	−1·9
Rainfall	Amount, inches	0·00	0·74	4·27	2·90	2·30	9·37	6·89	6·96	2·71	2·02	7·70	6·04	51·90
	Departure from average	−2·06	−1·54	+0·61	−0·86	−1·26	+2·21	+1·00	+1·27	−1·79	−1·33	+5·70	+4·82	+6·97

The above figures have been kindly furnished for this report by the Director of the Siccawei Observatory.

epidemic of cerebrospinal fever in Hongkong in the early months of the year during a period of unusual cold. This exceptional cold led to the closing up of fresh air openings into living and especially into sleeping rooms, where people huddled for warmth, so that such an infection once introduced had the best chance of spreading. This should be an object lesson to us in Shanghai, where overcrowding is excessive and practically unrestricted. A careful watch was kept for cases in Shanghai, and when no less than five cases were reported within two days a similar epidemic seemed likely. However, nothing more alarming than a few sporadic cases arose, although in Hankow and in some Japanese ports a considerable number of cases were reported.

The third unusual shock occurred towards the end of May when the great pandemic of influenza suddenly impinged on Shanghai without warning, except that some vague reference to "Spanish Disease" had already appeared in the press. The tremendous sweep of influenza is so distinctive that no other disease but dengue resembles it, and the latter is limited to warm countries. A definite diagnosis was made within a couple of days, which proved to be the right one. Though Shanghai was visited by two epidemic waves, that is in June and October, compared with many other places it escaped lightly, which is remarkable considering the excessive overcrowding. China is, however, generally considered the real home of influenza, so that close acquaintance has conferred some degree of immunity on its people. A former epidemic originating in China was known in Russia as "Chinese Influenza," passing into Europe it was known as "Russian Influenza," from Europe it spread to America and was known as "European Influenza," finally it reached Japan, where it was called "American Influenza"; having circled the globe and reached its original home, China, where many millions constitute the fountain head of epidemic disease. As communications are increased, it becomes ever more necessary for the safety of the whole world to develop modern public health administration throughout China.

The influenza pandemic with its millions of dead compels attention to the preventive possibilities of a suitable respirator or face mask, to the use of which the Manchurian epidemic of pneumonic plague first called serious attention. In the presence of pneumonic plague the Mukden plague mask rendered the wearer immune from danger. The mechanism of spread through droplets sprayed out from nose and throat in coughing, sneezing or even speaking is the same in influenza; but also in many other of the great group of respiratory infections. The use of a suitable respirator, or mask, or veil, under conditions where infection is probable, would tend to wipe out the whole group of respiratory infections, of which the "common cold" is the most obvious, but which also covers lung tuberculosis, scarlet fever, diphtheria, measles, whooping-cough, cerebrospinal fever, and many of the dangerous pneumonias, including those caused by influenza and plague.

Colonial Medical Reports.—No. 113.—Shanghai (*contd*).

In the pursuit of wealth and pleasure the most difficult, tiresome and laborious precautions are taken to procure the desired result; but to secure the absence of often fatal illness the smallest precautionary restraint is usually cast aside. The damage due to wild animals and crime is fully recognized, but the hidden dangers, infinitely greater, from the microbes of disease brought to light by scientific research during the last fifty years, have not yet been incorporated into the essential code of everyday life. How great are the potentialities of future preventive work. How great the need for education in the things that matter, of which self-preservation is the most fundamental. It is only by a general knowledge of natural processes that a due assessment of the dangers which surround life can be made and guarded against by the public. Without such general knowledge no amount of preaching or compulsion can secure the right mode of conduct of life.

In the present generation such diseases as small-pox, leprosy, plague and typhus fever, previously quite common, are almost as extinct as the dodo in those nations which have most profited by scientific education. And it seems certain that within a few generations all disease which is now known to be preventable will indeed be prevented.

A little while ago epidemics were looked upon as visitations of Providence sent for punishment for sin and so accepted as beyond the power of man to combat. But epidemics are a punishment for sin—the sin of ignorance. The removal of such ignorance by the study of nature, rather than by metaphysical speculations into the unknowable, is rapidly making for new conditions of life; so that in the near future, say within two or three generations, it will be the rule rather than the exception to live the allotted span.

As every case of preventable disease prevented means increased efficiency and happiness, the broad outlook as regards public health is sublimely optimistic.

Vital Statistics.

Population.

The Foreign Population of the settlement north of the Yangkingpang, including the outside roads and Pootung, at the last census taken on October 16, 1915, was 18,519, and consisted of 8,197 men, 6,044 women and 4,278 children. The foreign shipping population, which numbered 2,296, was not included. The foreign population for the middle of 1918 was calculated as 21,000. The census of the foreign population taken at each quinquennial period since 1870 shows the following expansion: 1,666, 1,673, 2,197, 3,673, 3,821, 4,684, 6,774, 11,497, 13,536, 18,519.

The Chinese Population on October 16, 1915, was 620,401, and consisted of 284,188 men, 165,623 women and 170,581 children. The Chinese population for the middle of 1918 was calculated as 659,000. The census of the Chinese population taken at each quinquennial period since 1870 shows roughly the following expansion: 75,000, 96,000, 108,000, 126,000, 168,000, 241,000, 345,000, 452,000, 488,000, 620,401.

Deaths.

Deaths among the Resident Foreign Population.—During the year 1918 the total corrected number of deaths registered among foreigners, including non-Chinese Asiatics, was 434; of this number 348 occurred among the resident population.

Six months spent continuously in Shanghai is taken to constitute residence as in former reports. As the non-resident population is a variable and indeterminate factor, the deaths in this category are eliminated in the calculation of the death-rate. The death-rate per thousand per annum, therefore, calculated from 348 deaths occurring among the resident foreign population of 21,000, is 16·5 as against 20·7 in 1917. The deaths of 129 children (persons under 15) have been registered, as against 169 last year; of the deaths among adults, 137 were men and 82 were women; of children, 67 were boys and 62 girls. The mean age at death among the adult resident population was 41·2.

The sharp incidence of small-pox at the end of 1917 rapidly subsided early in 1918 and then continued completely absent.

Cholera remained conspicuous by its absence.

Typhoid fever diminished and paratyphoid increased, but the respective incidence was due rather to improved diagnostic methods than to epidemiological change. There was a considerable diminution in the total mortality of the combined infections.

Scarlet fever showed a marked diminution.

Diphtheria continued of mild type.

There was an entire absence of plague both in rats and man.

Pneumonic plague imminently threatened but Shanghai remained immune when Nanking was infected by an extension of the Shanse epidemic.

Tuberculosis flourishes apace and awaits the coming campaign.

There were no deaths from hydrophobia.

Beriberi increases with the Japanese community.

Influenza was epidemic in June and October, killing nine persons as a part of the universal pandemic killing millions.

Cerebrospinal fever which was so fatally prevalent in Hongkong during the early months of the year caused a few sporadic cases in Shanghai.

Deaths among the Chinese Population.—8,441 deaths among the Chinese have been reported, compared with 10,217, 8,156, 8,329, 8,524, 6,799, 9,663, 8,062, 8,453, 8,173, 8,198 and 9,612 in sequence of preceding years.

The death-rate per thousand per annum is 12·8. Of the deaths, 4,519 were male and 3,922 female. The deaths of 2,733 children (persons under 15) have

been registered; of these, 1,395 were boys and 1,338 girls.

Infectious Disease.

Notification.—In the absence of legal obligation to notify, an arrangement has been made with the qualified medical practitioners of Shanghai requiring notification of infectious disease for the facilitation of preventive measures, in consideration of the use of the resources of the Public Health Laboratory for the purposes of pathological diagnosis and the payment of a fee of one tael for each case. The notifiable diseases are: small-pox, cholera, dysentery, typhoid fever, paratyphoid fever, typhus fever, diphtheria, scarlet fever, tuberculosis, plague, anthrax, glanders, leprosy and hydrophobia.

The system of notification, so far as it goes, has worked well, and the best thanks of the community are due to our colleagues in general practice for their co-operation. Chinese cases are beginning to be usefully notified by Chinese practitioners educated according to the foreign standard.

During the year 77 Bills of Health for ships and cargoes were issued, as against 126, 149, 90, 86 and 95 in sequence of years from 1913.

Weekly returns of infectious disease have been exchanged so as to keep in touch with the sanitary condition of places in the Far East in communication with Shanghai.

Isolation.—Isolation for cases of infectious disease among foreigners and Chinese is provided in the Isolation Hospital, Range Road.

Disinfection.—The Disinfection Station adjoins the Isolation Hospital. Prior to disinfection each disinfector puts on a sterile overall. The general method of disinfecting in a house after a case of infectious disease is first to remove to the Station everything that can be disinfected by steam; then to spray and wash walls, floors, fittings and furniture with disinfecting solution (cyllin). Fragile and delicate articles, such as bonnets, books and photographs, are disinfected by formalin. In many cases, such as after typhoid fever or diphtheria, disinfection of walls, &c., is not considered always necessary, the washing with disinfectant being then limited to articles that have been actually in contact with infected material. After disinfection, painting or colour-washing of walls and ceiling is advised to be done by the occupier before the room is again occupied.

Small-pox.—The recrudescence of small-pox in 1917, attributable to an accumulation of non-immune material from outside Shanghai, yielded early in 1918 to the speeding up of vaccination. The number of free vaccinations done at the Branch Health Offices during January, 4,219, of which 682 were foreigners, made a new monthly record. A considerable number of vaccinations were done of the Chinese staff of business firms by special request at the offices of firms, as an emergency measure. This was, however, discontinued, as it was felt that such free vaccination should be done only at the Branch Health Offices to which the public should mainly look for their practical sanitation.

Where taipans or householders wish to make certain that their employees have been vaccinated at the Branch Health Offices, if a chit stating the number to be vaccinated is sent with them it will be signed as done by the Health Inspector in Charge; substitution can be defeated by stamping the palm of the hand of each employee with their office rubber stamp; or an examination of the upper part of the left arm five days after will reveal a definite proof of vaccination.

It may be noted that the old practice of inoculating small-pox is still done to a small extent in Shanghai. One or more "practitioners from Ningpo" come to "place the seed" of genuine small-pox within the nose of babies. This sets up small-pox, usually of mild type; but each case is as much a focus of infection as a case caught in the ordinary way. With the facilities now provided for vaccination the practice of "inoculation" can only be regarded as pernicious, being calculated to create more small-pox than it prevents.

China is no place for the unvaccinated. Since the beginning of the war there has been an unusual influx of foreigners who had not taken the very necessary precaution of vaccination before they embarked from their homelands for China. These furnished very easy meat for the infection of small-pox, which is ever present in China. Several severe cases among such foreigners were infected on the very day they landed in China. It seems necessary to give a warning to those who are responsible for bringing employees out to China, that vaccination should always be done before embarkation.

In China there is so much small-pox infection that vaccination should be repeated every three years; and care should be taken to have the vaccine fresh, as it soon spoils, especially in warm weather. As a rule the best time to be vaccinated is early in November.

Cholera.—Shanghai since 1912 has continued very fortunate in the absence of cholera and the limitation of the incidence of choleraic diarrhœa to very small proportions, although Japan and the Philippines have been rather severely infected. Meanwhile such precautions as were possible in regard to the food supply were continued unabated. The regrettable "hawkers' riot" prevented the prosecution of a very necessary development having for its object the limitation of the sale on the streets of foods especially liable to be infected with cholera, dysentery, typhoid fever, &c.

Typhoid Fever.—The incidence of typhoid fever remains an important sanitary factor. Every case of typhoid fever, cholera and dysentery means a short circuit between the bowel discharges of one person and the mouth of another. In nearly all cases where the origin was investigated obvious breaches of the ordinary rules of health, as laid down in the Public Health Notice, were observed.

The infection of typhoid fever may be conveyed by vegetables and oysters which have been contaminated with infected ordure, by water, by milk contaminated with infected water, through the air

by means of infected dust, and directly from persons suffering from the disease or who act as "typhoid carriers" subsequent to recovery. Typhoid fever is a preventable disease, its prevention being largely a matter of individual care in the observance of the rules set forth in the Public Health Notice which has been issued to all applicants at the Health Office. It is important to remember that the urine as well as the fæces are infective in cases of typhoid fever.

The cause of typhoid fever is practically always taken into the body with infected food, and the foods most commonly infected are vegetables, by reason of the manner in which they are grown. Especial stress should be laid on the fact that vegetables are frequently the source of infection with typhoid fever, cholera, dysentery and other forms of diarrhœa, and particular care should be given to their thorough cooking and separation before cooking from the rest of the food. The larder or room for storing uncooked food should be separated from the pantry or serving room where table utensils, ice-chest, bread, milk, germ-proof filter and cooked food are kept. There should be a washing-up sink in the serving room so that table utensils need not be taken into the kitchen to be washed. A place in the yard outside the kitchen for the washing and preparation of vegetables prior to cooking is an additional precaution that may be recommended.

The evidence in favour of typhoid vaccination increases and it involves no risk. Young people especially are advised to have it done on first coming to Shanghai when the danger of infection is greatest. Useful immunity probably lasts three years. Not only is it now certain that the liability to disease is lessened but if contracted the mortality also. It is advisable to repeat every year if especially exposed to infection. The time would appear to have come for offering free vaccination against typhoid fever in the same way as against small-pox.

Paratyphoid Fever.—There were 62 cases of paratyphoid fever notified and 4 fatal cases. Cases of paratyphoid B predominate over those of A in the proportion of 3 to 1. It has been the practice when issuing typhoid vaccines from the Laboratory to combine the organisms of paratyphoid fevers A and B. The reaction is scarcely greater for the combined vaccines while the protection is secured against all three infections, to the great content of those who are wise enough to appreciate the value of preventive medicine. The loss of service to business firms occasioned by these fevers clearly demonstrates the advisability of having their staffs protected by the mixed typhoid and paratyphoid vaccination, material for which is prepared in, and always obtainable from the Municipal Laboratory.

Amœbic Dysentery.—The incidence of amœbic dysentery was considerably less than in the two preceding years. In practically every case investigated after notification obvious breaches of the Public Health Notice were found which might have led to the conveyance of infection.

Servants with chronic dysentery are numerous and are carriers of infection by finger infection of food. A house-boy, for example, with chronic dysentery cutting bread and butter is practically certain to pass on the infection to the consumer. Such chronic cases may pursue their usual avocations so that it is advisable to have any house-boy, cook or coolie, who appears to be getting thin, pale or weak, seen by a doctor and his fæces examined for dysentery amœba in the Municipal Laboratory so as to ensure the safety of the household.

Amœbic dysentery has always been endemic in Shanghai and, in the past, a frequent cause of chronic invalidism. The disease is carried by cysts, the amœbæ assuming a more resistant capsulated form which are passed in large numbers in the fæces of persons suffering or convalescent from untreated or improperly treated dysentery. Such persons, especially if house servants, are a great danger by infecting food, dishes, glasses, napkins, &c., with their fingers. Again, a fly within a few minutes of feeding on infected fæces begins to deposit droplets of liquid excrement and, in these, unaltered and living dysentery cysts occur. Thousands of such cysts may pass through a single fly and be deposited on food, &c., and the persons who consume the food become infected with dysentery.

Hookworm Disease.—The disease is prevalent around Shanghai in the rice districts, but among foreigners it is rare and is uncommon among Chinese residents, due mainly to the channel of infection being usually through the skin—that is to say, it is only common among those who wade or bathe in infected water. It is caused by the *Anchylostoma duodenale*. In its passage through the skin the larva produces an inflammatory reaction known as ground-itch. Within the body it produces anæmia by its blood-sucking habits. Infection is voided by the bowel.

Diphtheria.—Diphtheria was of mild type. Twenty-eight foreign cases were admitted into the Isolation Hospital with three deaths in very young children. Diphtheria antitoxin is supplied free for indigent patients in Shanghai on the recommendation of the physician. In any case of suspected diphtheria, antitoxin should be given at once, without waiting for the result of the bacterial diagnosis. Formerly bad drains and sewer-gas were given as one of the causes of diphtheria; this is a fetish which dies hard, and tends to obscure the real cause, namely, direct transfer of infection from a previous case or carrier, and to mislead the public in whose hands prevention really lies. The control of diphtheria is almost entirely the control of the infective person. The use of antitoxin has reduced the case fatality to one quarter of what it was but has not materially reduced the number of cases and has probably increased the number of carriers. In those cases where the diphtheria bacillus persists in the throat or nose after convalescence it seems likely that a spray of the recently prepared dichloramine-T would greatly help in rendering them non-infective.

Scarlet Fever.—Early diagnosis and isolation is necessary for preventing spread. Transmission is in

accordance with the general rule regarding the respiratory group of diseases, namely, by droplets sprayed from nose and throat. A discharging ear following scarlet fever is usually a sign of danger that the throat may still be infectious. The peeling skin has nothing to do with the transference of the disease but is an outward and visible sign of previous scarlet fever. Disinfection of rooms, clothing, &c., is far less important than preventing infection from the nose and throat of the patient. Such infection can be prevented by a face mask of gauze and wool. Contacts should be quarantined and inspected daily

Cerebrospinal Fever.—An unprecedented epidemic of cerebrospinal fever occurred in Hongkong from January to May, considerably over a thousand cases being reported, although only four were Europeans. Some 760 deaths occurred. It is believed that sporadic cases had occurred from time to time in previous years. In Manila 70 cases were reported in 1915. The prominence given to the epidemic in the press gave rise to a feeling of apprehension in Shanghai. It was, however, pointed out that though cerebrospinal fever was widely distributed throughout the world, and occasionally flamed up in epidemic form, such epidemics are not as a rule widely diffused and that, therefore, it did not follow that Shanghai was necessarily so endangered by the prevalence in Hongkong. A careful watch was kept for cases, facilities afforded for bacteriological diagnosis and for examination of carriers, for isolation of cases and for the provision of curative serum. Our prognostication proved correct, a few cases occurred sporadically, singularly enough five cases were discovered within two days; in all thirteen cases during the year, one of which was traced to Hongkong and one to Hankow, where the disease was also reported prevalent. Cases have been reported in previous years as occurring sporadically in the Yangtsze Valley, but it has rarely been found in the mortality figures of Shanghai. There were sixty cases reported in Swatow in March this year but none apparently in Canton, which is in such close proximity to Hongkong. It was also reported prevalent in Amoy and Hankow in April.

Cerebrospinal fever is a winter disease, corresponding very closely with the prevalence of "colds and sore throats," with a maximum in March. It is spread by droplets sprayed out of the nose and throat, apparently mainly by unknown carriers, who do not themselves become sick but who harbour in the back of the nose the microbic cause, the meningococcus. In this sense it is a generalized infection in the locality where prevalent, cases being as a rule single and independent. This makes prevention very difficult. Even where epidemic there are many carriers and comparatively few cases. The meningococcus is exceedingly susceptible to drying and scarcely has existence outside the human carrier, so that preventive measures may be so limited.

In his report to the Hongkong Government, Dr. Peter K. Olitsky of the Rockefeller Institute records that the infection in Hongkong was caused in 95 per cent. of cases by type 1 of Gordon's classification of meningococci. By agglutination tests all strains can be referred to four main types. The same type was found in Manila cases. It is probable that this type would be also found in Shanghai cases, so that it would be advisable to use a curative serum in which this type was prevalent. Most commercial sera are described as polyvalent. The commercial sera tested, however, gave poor results. Large quantities of serum may be used, e.g., 200 c.c. intravenously and 40 c.c. intraspinally. The earlier serum is given the better the results. Exceptionally dry and cold meteorological conditions prevailed during the epidemic in Hongkong, leading to unusual overcrowding and lack of ventilation. There is a probability that preventive vaccination may become useful. As regards contacts a search should be made for the "dangerous" carrier, that is, one harbouring numerous meningococci of the type found in actual cases locally. During the prevalence of an epidemic it is advisable to prohibit the departure by rail or ship of any actual contact with a case, especially those contacts shown by bacteriological examination to be dangerous carriers.

The following memorandum for medical practitioners was prepared, acknowledgments being made to the United States Public Health Service Reports.

CEREBROSPINAL FEVER.

Memorandum for Medical Practitioners.

The following observations are offered so as to help in the prevention of the disease.

Infective agent: The meningococcus.

Source of infection: Discharge from the nose and mouth of infected persons, convalescents, mild cases, and healthy persons who may be carriers. Carriers and mild cases are believed to be the principal agents in the spread of the disease.

Incubation period: Two to ten days, commonly seven days.

Methods of control:

(*A*) The infected person.

(1) Recognition of the disease—Clinical signs, confirmed by laboratory examination of spinal fluid obtained by lumbar puncture and of naso-pharyngeal swabs.

(2) Isolation of infected persons, and carriers, until the naso-pharynx is free from the meningococcus, or at the earliest until one week after fever has subsided. Does not necessarily require isolation in Isolation Hospital.

(3) Immunization by vaccines still in experimental stage.

(4) Disinfection of discharges from the nose and mouth and articles soiled therewith.

(5) Carriers have been found to clear up well with gargles and nasal douches of normal saline solution.

(6) Terminal disinfection.

(*B*) General measures.

(1) Search for carriers among families and associates of recognized cases by laboratory examination of swabs from posterior nares of contacts.

(2) Instruction as to necessity of avoiding contact and droplet infection.

(3) Prevention of overcrowding and inadequate ventilation. Avoidance of crowds, especially indoors, crowded cars, cinematographs and other crowded places. Limitation of visiting. Keeping children, especially below school age, at home so far as possible; children and young adults being most susceptible.

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